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A MODEL RETAIL IDENTIFICATION PLAN FOR SEAFOOD SPECIES

A DESCRIPTION OF THE PROJECT AND RECOMMENDED PRINCIPLES OF IDENTIFICATION

PREPARED FOR THE UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
INSPECTION AND SAFETY DIVISION

PREPARED BY THE BRAND GROUP, INC.
CHICAGO, ILLINOIS
WILLARD HARRISON DOYLE, PRESIDENT

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EXECUTIVE SUMMARY

The Facts

1. The number of seafood products that are currently marketed at retail in the United States is enormous. The total count of individual products is probably well in excess of 100,000. These are derived from hundreds of different species of commercially available finfish and shellfish.

2. There is considerable inconsistency in the nomenclature that appears on seafood product labels, especially nomenclature which is intended to enable shoppers to identify and distinguish products.

3. When a processor attempts to find standards for identifying seafood products or species, he finds in most cases that standards do not exist, and that there are no effective criteria to facilitate efficient, effective decision making.

4. Based on improved processing techniques and increased access to resources, there is significant potential for expanding seafood industry markets and per capita seafood consumption in the United States.

The Problems

1. Americans know relatively little about purchasing, preparing, serving and about the edibility characteristics of various seafood species and products. Consumers are confused about seafood and hold many negative misconceptions. Due to the lack of knowledge and of an effective identification program, consumers find it difficult to shop intelligently for seafood. As a result, they confine purchases to a few familiar items.

2. The seafood industry's ability to market unfamiliar seafood products and species is seriously impaired by the consumer's lack of knowledge. As a result, the great potential for effective use of seafood resources has never been realized in the United States.

3. Regulatory agencies and seafood processors often find it difficult to agree on names that are attractive to the consumer and fulfill labeling requirements. Regulatory decisions often take considerable time and are restrictive to the seafood industry.

4. The primary problem is to determine how we can do a better job of identifying seafood species and products in a way that is convenient and informative to consumers.

Purpose

The overall purpose of this project was to produce a "model retail identification plan" for seafood species that will result in an effective labeling program.

Specific objectives were to:

1. Develop a representative selection of aquatic species for use in the model.

2. Identify and prioritize a set of factors to be used in comparing and organizing the species.

3. Develop a tentative system for rating each of the factors. Develop a factor profile for each of the species based on ratings for each of the factors.

4. Develop a model based on key factors to demonstrate how effective species identification can be accomplished.

5. Review and evaluate the model.

Methods

1. A program of industry and consumer research was conducted to acquire sufficient qualitative data to develop the factor profiles for use in the model.

2. Computer techniques were used to analyze the data. The contractor's staff developed the identification concepts and models.

3. A focus group discussion was conducted with an ad hoc review board to evaluate the model.

The Model Plan

The identification plan consists of two major components:

A. An organizational framework that encompasses all aquatic species

B. A nomenclature system that provides a name for each species and kind of product needing identification

The framework segment of the model is based on three major categories of seafood products:

* Products made from individual species of finfish or shellfish

* Products made from a mix of species with similar edible characteristics

* Products made from a mix of species that have different edible characteristics

Finfish and shellfish have been classed separately. Zoological groups of shellfish have been used in this model while new groups of finfish have been formed on the basis of comparing the characteristics of the edible portion (the meat) of the fish. Twenty-five groups of "similar" finfish have been established.

A strategy for a nomenclature system has been designed that uses three different kinds of names to distinguish each of the three product categories.

The nomenclature plan makes use of the existing common names for identifying shellfish (i.e., Clams, Lobsters, Oysters, etc.) but provides for a new set of names for finfish. The strategy for finfish names involves creating a "Base Name" to identify each of the 25 groups of finfish and an extension of the Base Name to identify species within each group.

Recommendations were also prepared for using the edibility profiles for resolving naming problems on an interim basis until a comprehensive identification can be developed.

Review and Evaluation

The plan was reviewed by a panel of specialists representing the seafood industry, consumers, regulatory agencies, and other concerned viewpoints. The discussion primarily involved how specific details would be worked out.

In general, responses agreed with the directions and concepts proposed in this model and that a comprehensive labeling program is necessary for both of the following reasons:

1. the education and interests of consumers relative to the purchase and use of seafood products;

2. the ability of the seafood industry to market its products more effectively.

Recommendations

The principal recommendation is that the National Marine Fisheries Service (NMFS) act now to establish, on a permanent basis, a programmatic effort to develop a comprehensive identification system based on the guidelines developed in this report and in U.S. Government Contract #4-36730 (Retail Identification Plan for Fishery Products-March, 1975).

Three programmatic areas for immediate development are:

1. Develop a comprehensive, consistent data bank related to edible characteristics for all commercial aquatic species.

2. Delineate and implement a plan for making interim decisions on nomenclature issues in cooperation with regulatory agencies and consumer representatives.

3. Conduct a program to educate members of the seafood industry to concepts outlined in this report and encourage cooperative industry marketing efforts (especially for underused species) that emphasizes these concepts.

RECAPITULATION OF PROJECT METHODOLOGY

Background and Perspective

The seafood industry offers a more bewildering array of species and products than any other food industry in the world, and new species and products are finding their way into the marketplace at an ever increasing rate.

The absence of a comprehensive program for identifying this vast array of products permits inconsistencies to arise in the use of nomenclature. This contributes to confusion at the consumer level. It also creates an environment where it is often difficult for a processor to develop product identification that satisfies consumers, regulatory agencies, and the rest of the seafood industry.

Potential markets exist for every product the seafood industry can produce. While individual processors can probably continue to develop markets for species and products on a one-at-a-time basis, the future growth of the industry will be hampered by the lack of a national system of seafood identification.

In July, 1974, Brand Group, Inc. (BGI) was given an assignment (U.S. Government Contract #4-36730) by the National Marine Fisheries Service to review a variety of problems related to labeling and naming seafood products and to develop recommendations for a retail identification plan that would encompass all seafood marketed in the U.S. The final project report, submitted in April 1975, described a workable approach to developing an effective product identification (labeling) system.

The ultimate goals remain to develop a comprehensive product identification system and to implement the system on a nationwide basis. During the initial project, BGI outlined an identification system that would enable clear product identification and would be easy to use and informative as well. In July 1976, BGI was given this assignment by NMFS to pursue development of one special component of the plan.

The product identification plan includes three nomenclature components: FISH, FORMS and MODIFIERS.

This current project (U.S. Government Contract #6-35338) deals with the key element of the plan: identifying the kind of FISH in the product. This report demonstrates how, with a well conceived identification system, consistent species identification can be made and consumers can be provided with useful information to help them shop more easily and intelligently. The plan is based on determining which species of finfish and shellfish are most alike in terms of their edible characteristics. The model is a simple nomenclature framework that will reflect these similarities.

The plan provides for latitude in the types of new seafood products that can be developed. In BGI's opinion, current interpretation of labeling laws limits new product development. Since the plan establishes clear distinctions among products and objective guidelines for naming, it will reduce the need for restrictive labeling regulations while enabling FDA and consumers to monitor identification more effectively.

The project included the following four steps, leading to the development of this report and recommendations:

Step I	Develop a data bank related to the edible characteristics of seafood species.
Step II	Analyze the data bank to determine species that have similar characteristics.
Step III	Develop a model identification plan that is based on describing edible characteristics.
Step IV	Review the model plan with an independent panel of experts to identify ways to implement the plan most effectively.

The following four sections describe each of these steps in greater detail.

STEP I

DEVELOPMENT OF A DATA BANK OF EDIBILITY PROFILES

The first step in this project was to develop a data bank to provide a basis for comparing the edible characteristics of aquatic species.

The following three components were involved in compiling the data bank:

A. Selecting a representative cross section of edible aquatic species (finfish and shellfish)

B. Identifying a list of factors (characteristics) for comparing the species

C. Consistently rating each of the species for each of the factors

As little of the information necessary to compile the data bank was readily available, a research program was conducted to acquire qualitative data.

Methods of Collecting Data

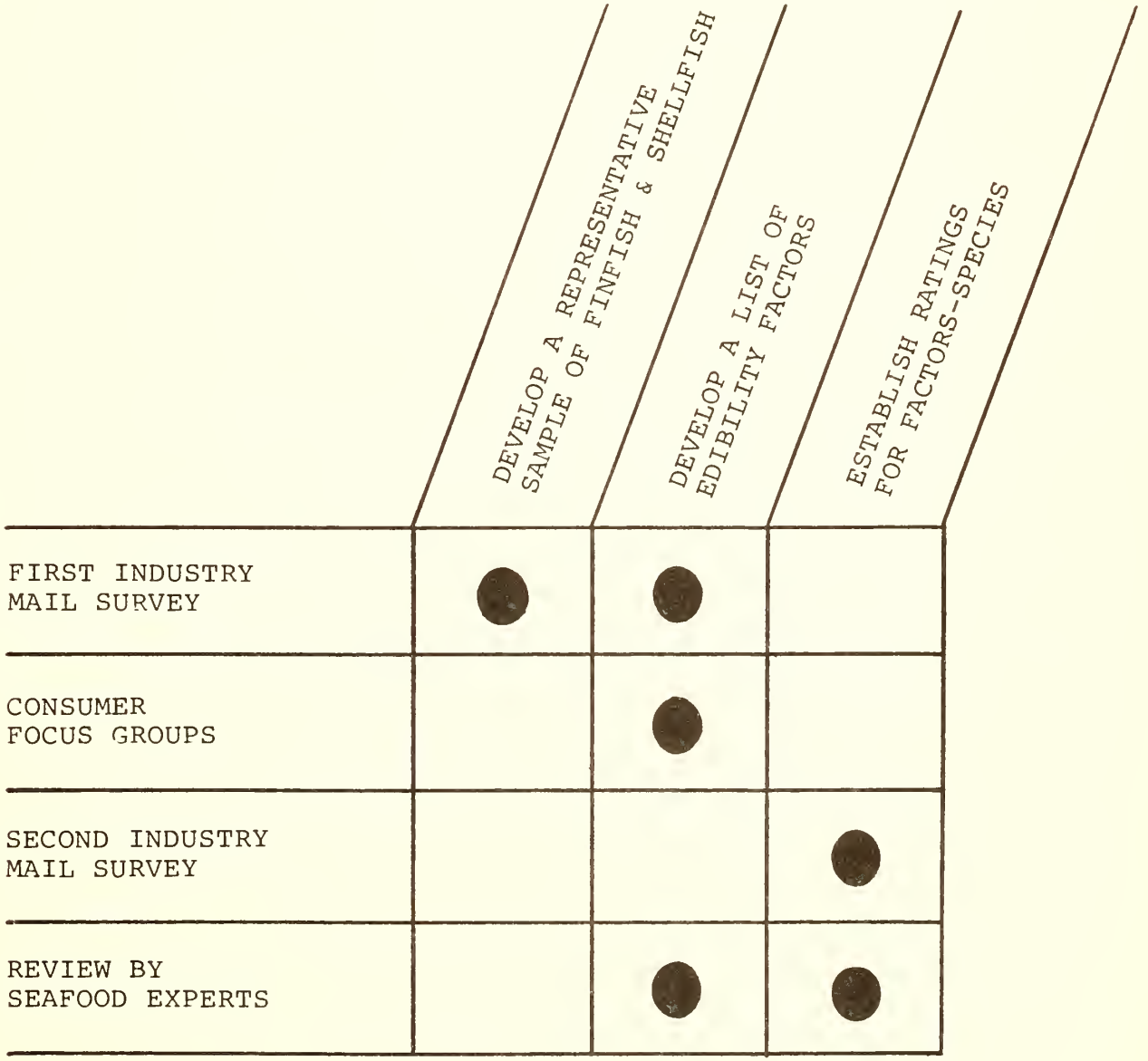
The research program is illustrated in Figure A.

To collect technical data on a cost-efficient basis, two mail surveys were sent to specialists involved in the seafood industry. For the most part, these were individuals who have spent a minimum of 15 years in close contact with seafood species and products.

The first industry mail survey was conducted to develop the sample of finfish and shellfish species and to identify and prioritize factors.

Figure A

DATA BANK RESEARCH PLAN



To collect consumer data, two focus group discussions were held with housewives who use seafood products frequently. Results were used to verify the industry factor list by comparing the consumer viewpoint.

The second industry mail survey was conducted to rate each factor for each of the species in the sample.

Following tabulation of the survey, the ratings were reviewed and validated by a panel of seafood experts.

A. Selecting a Representative Cross Section of Edible Aquatic Species (Finfish and Shellfish)

As it would have been impractical to include all commercially marketed aquatic species, a representative sample was compiled for use in developing this model. The sample was targeted to include between 100 and 200 species, representing a wide spectrum of edible characteristics including the extremes for each of the edibility factors.

A tentative list of finfish and shellfish was assembled from a variety of references including:

* Bailey, Reeve M. (Chairman). American Fisheries Society Special Publication No. 6: A List of Common and Scientific Names of Fishes from the United States and Canada, third edition. Washington D.C.; American Fisheries Society, 1970

* U.S. Department of Commerce. Fishery Statistics of the United States 1970. Washington, D.C.; U.S. Government Printing Office.

* National Marine Fisheries Service. Food Fish Facts. Washington, D.C.; U.S. Government Printing Office.

* Jordan, David S. and Everman, Barton W. American Food and Game Fishes. New York Dover Publications, 1969.

* Tory Research Station. Fish Names in The Common Market. Great Britain.

BGI selections from these and other sources resulted in a list of 187 species (160 finfish and 27 shellfish) to be used in the first industry survey.

Tentative lists of species and factors were incorporated into a questionnaire for the purpose of eliciting the following information from industry respondents:

a. The finfish and shellfish species that respondents felt should be included in a representative cross section.

b. Those species that respondents were familiar enough with to rate on the subsequent (second) mail survey.

Potential respondents for this survey were selected from lists provided by NMFS and by officers of many of the major trade associations in the seafood industry. To qualify, respondents had to possess substantial knowledge and experience with seafood species and products.

The questionnaire was mailed to 760 individuals and 159 of them replied. A result of this survey was the addition of 80 finfish and 45 shellfish to the list.

The criteria used to determine whether a species should be kept in the sample for the second survey was: a) a minimum of 10% of the respondents stating that the species should be included, and b) a minimum of five respondents stating that they could rate the species for edible characteristics. Further recommendations by experts in the seafood industry on species that should be included to "fill gaps" rounded out the list.

The second mail survey included 250 species (191 finfish and 59 shellfish). Two hundred seven species (164 finfish and 43 shellfish) were finally rated, and sufficient ratings for inclusion in the similarity studies were obtained for 158 species (123 finfish and 35 shellfish).

B. Identifying a List of Factors (Characteristics) for Comparing the Species

A large number of factors affect seafood species and products. Some are natural characteristics of the species such as the effects imposed by seasonal variations, migratory habits, breeding and eating habits, and so on. Other factors, such as environmental factors, are not natural to the species but can have a significant effect nonetheless. Finally, how the species is treated during and after it is caught has a great deal to do with the characteristics of the end product. How carefully a fish has been handled, how fresh it is, and how it has been processed and packaged all have an effect on the quality of the retail product. With hundreds of factors to consider, the primary objective of both the first industry mail survey and the consumer focus group studies was to identify and rank the most important factors to be considered in comparing edible aquatic species.

Forty individual factors were presented to industry respondents in the first mail survey for consideration and for ranking and rating. The factors were distributed among the following five categories:

1. <u>External Characteristics of the Species</u>

   Pertaining to the outward physical appearance of the species (color and markings, body shape, etc.)

2. Internal Characteristics of the Species

   Pertaining to the organoleptic properties of the meat and to the kind and number of bones in finfish

3. Environmental and Other Factors that Affect the Edibility of the Species

4. Factors Related to Processing the Species

   Pertaining to what the industry does to the species

5. Factors Related to Preparing and Serving the Species

   Pertaining primarily to what the consumer does to the species

Industry respondents were asked to review the lists, to indicate their opinion as to the relative importance of each of the factors and to write in additional factors which they thought were important enough to include. General results were as follows:

Factor Category	TOTAL- Originally on Questionnaire and Added by Respondents
External characteristics of the species	93
Internal characteristics of the species	64
Environmental factors that affect edible characteristics	45
Processing factors - conditions imposed by industry processing	50
Preparation factors - related to consumer purchase, preparation and serving	27
	279

Totals include factors that are specific to finfish and shellfish and factors that are common to both.

Comparison of Industry and Consumer Viewpoints

Consumer focus group discussions were held to determine the general awareness and knowledge of seafood products that seafood consumers have, and to determine what factors consumers feel are important in shopping for, preparing, storing, and serving them. As in the industry surveys, the objective was to identify, rank, and rate a list of pertinent factors. The results of consumer focus groups enabled us to compare consumers' needs and desires for information with industry's perspective of what information would be most useful to consumers.

Two focus groups were conducted with 10 women in each group. The qualifications were 1) have prepared and served fish or shellfish at least three times per month, 2) when they buy fish they generally reflect on the kind of fish they will buy (i.e., Trout or Halibut), 3) have lived at least one year in a coastal area.

The focus group participants ranked and rated a series of factors that had been identified in earlier research using a combined shopping-preparing-consuming frame of reference.

They also discussed the factors, suggesting additional factors and indicating those which they felt to be unimportant. In an attempt to provide a better perspective from which to discuss the factors, respondents were asked to relate factors to specific fish. Finally, the idea of organizing fish according to edibility factors was introduced and discussed.

By comparing the results of the industry mail survey and the consumer focus groups, it appeared clear that industry and consumers are very much in agreement as to which factors are most important. Both gave the highest ratings to factors having to do with the organoleptic properties of the edible portion of the species: taste, texture, color, odor, moisture, and fat content of the meat. This confirmed similar observations made during consumer focus groups and industry interviews in the previous project (Contract #4-36730).

The result was a clear, albeit qualitative, indication that consumers' first priority is to have information related to the edible characteristics of seafood meat and that these characteristics should become the basis for organizing and for identifying seafood species and products.

More than 270 separate factors were identified for consideration during this research. The following criteria were used to reduce the number to 55, a more manageable number for the second mail survey:

* Include factors that are representative of natural characteristics of the species. (Factors imposed by "unnatural" influences such as pollution, mishandling or lack of freshness were excluded.)

* Include factors that have a relationship to the edible portion of the fish. (Factors were excluded if they did not relate directly to the meat of the fish.)

* Include factors that relate to all aquatic species. (Factors were excluded if they were only characteristic of an individual species or a limited group of species.)

The selected factors were reviewed by a panel of seafood industry experts. They clarified the significance of various factors and made an overall review of the data to be used in the similarities studies.

As a result, the number of factors were reduced from 55 in the second industry mail survey to 8 that were considered to represent the most perceptible differences and to offer the most fundamental information to the consumer. These factors are:

* FLAVOR intensity
* FAT content
* ODOR
* COLOR
* FLAKINESS
* FIRMNESS
* COARSENESS
* MOISTURE content

All the species included in the similarity studies were rated on these 8 factors.

C. Consistently Rating Each of the Species for Each of the Factors

The final step in the research was to determine a rating for each of the species in the sample on the basis of each of the selected factors.

The second industry mail survey was sent to 159 individuals who indicated on the previous survey their willingness and ability to provide ratings for particular species. To broaden the base of the survey, additional sources were suggested by National Marine Fisheries Service (NMFS), National Fisheries Institute (NFI) and others. In total, 870 questionnaires covering 297 species were completed by 245 respondents.

Fifty-five factors were included in the second mail survey. Ratings given for most of the questions were based on a 5-point scale with 1 and 5 representing the extreme ranges among all species for a given factor.

In compiling ratings, respondents were given the following conditions:

* Judgment was to be used in providing the ratings. Respondents were self-qualified by indicating that they had sufficient experience and familiarity with the species to rate it.

* Ratings were requested within the framework of the whole spectrum of edible aquatic species. For example, respondents were asked to determine the fat content of a species relative to all other species including those with the highest and the lowest fat content.

* Ratings were to be determined within prescribed conditions of freshness. For example, ratings were to be made on the basis that fish were no more than 48 hours old and had been well iced to perserve fresh qualities.

* When a rating was taken after the species had been cooked, for example--"flakiness of the meat after cooking," the conditions of cooking were described as: properly cooked (not over cooked or under cooked), and cooked in a manner that least affects the natural characteristics of the meat.

* Factors had to be defined with sufficient clarity that individual respondents could agree on the definition and how the factors should be rated.

At least three responses were obtained for each of the species included in the similarity studies. Tabulations from the second industry mail survey provided a mean rating for each of the 55 factors for the 158 species (123 finfish and 35 shellfish). From these mean ratings, a profile of edibility characteristics was developed on a consistent 5-point scale for each of the species in the sample.

Verification of the Edibility Profiles

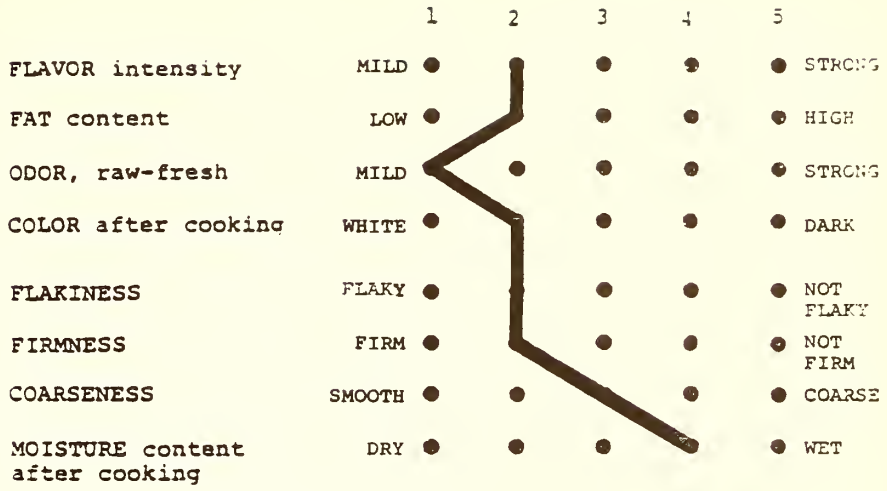
A panel of seafood experts reviewed all the edibility profiles in order to verify the ratings. Adjustments were made by this panel where necessary for consistency. The panel also made decisions on ratings for particular factors where there was ambiguity or lack of agreement in the responses.

Conclusions

The results of this research effort were intended to provide empirical data for use in demonstrating the workings of a model identification program. The data bank developed in this project is not intended to be taken as statistically accurate. But, it shows how important and useful the data bank is. Following is a compilation of the data bank of edibility profiles developed and used in this project.

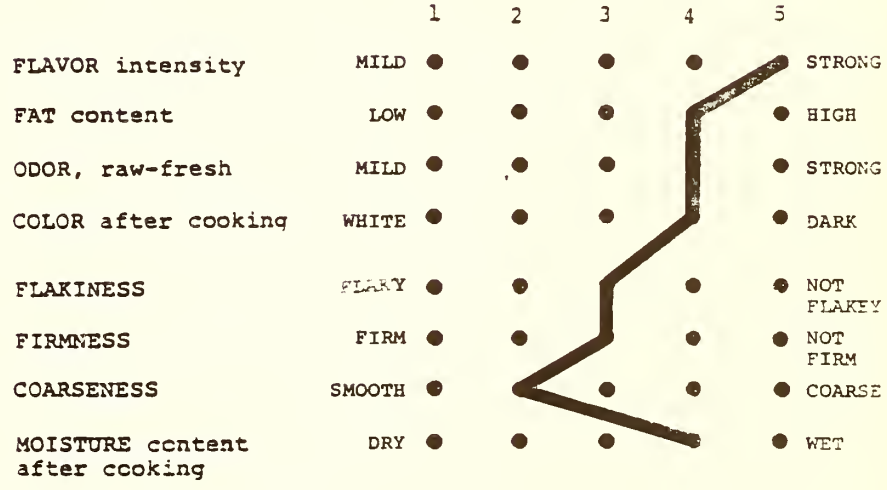
- Striped BASS (Rockfish)

Morone saxatilis



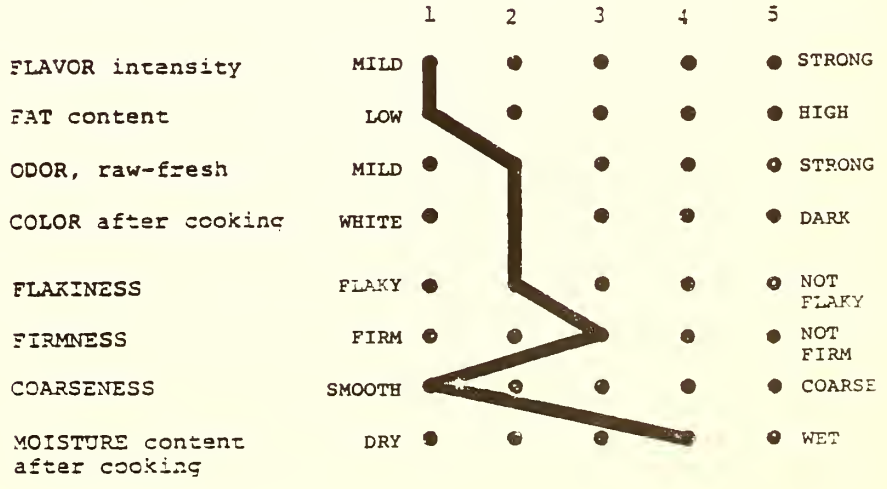
- BLUEFISH

Pomatomus saltatrix



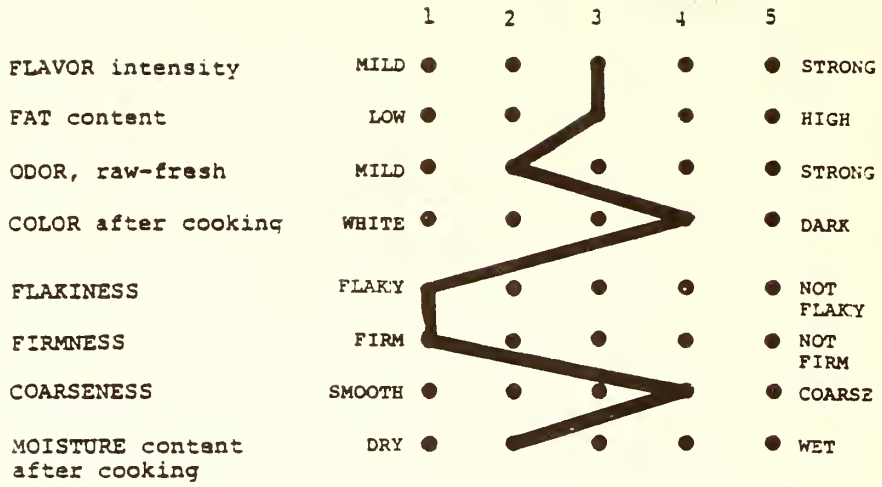
- BLUEGILL

Lepomis macrochirus



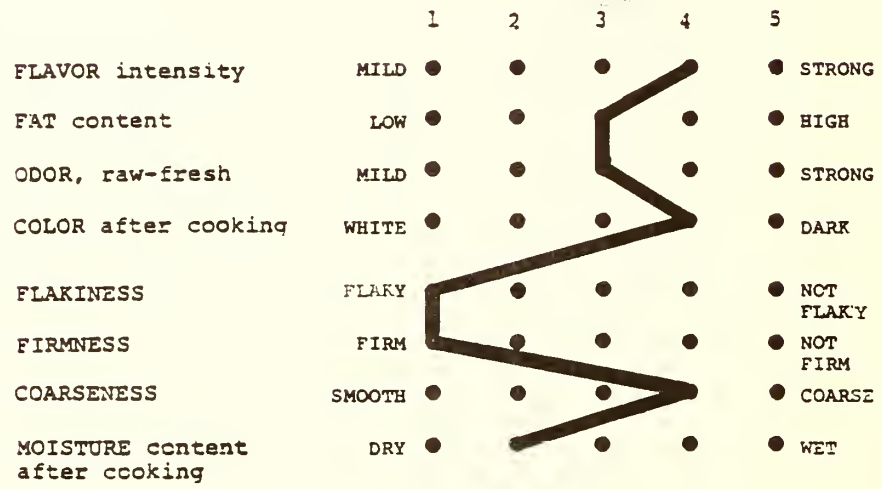
- Atlantic BONITO
  (Common Bonito)

  Sarda sarda



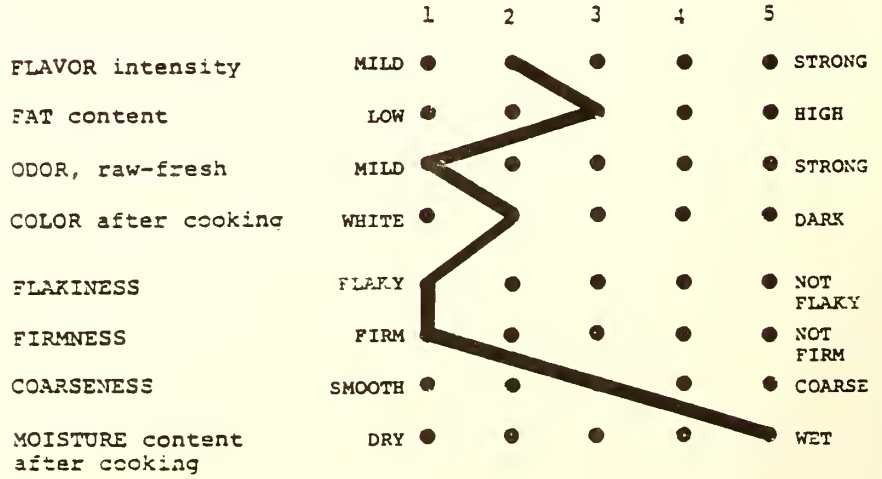
- Pacific BONITO
  (California Bonito)

  Sarda chiliensis



- Bigmouth BUFFALO

  Ictiobus cyprinellus



- **Smallmouth BUFFALO**

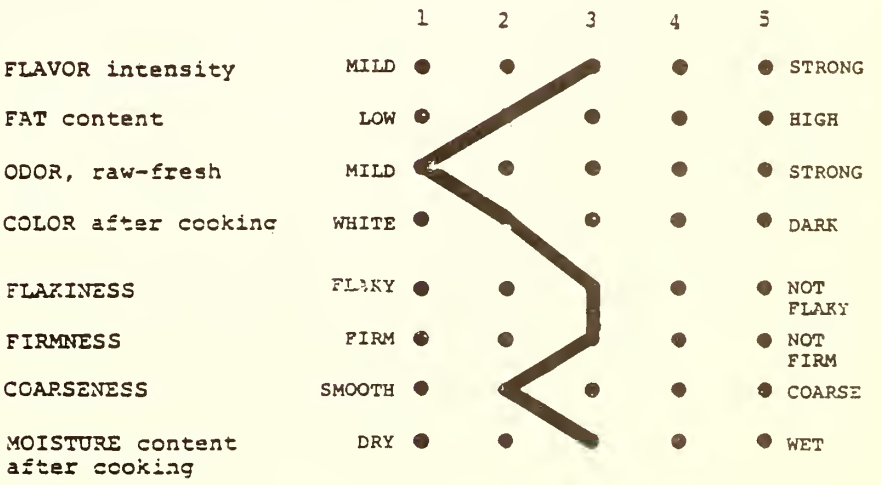
  Ictiobus bubalus

- **Brown BULLHEAD**

  Ictalurus nebulosus

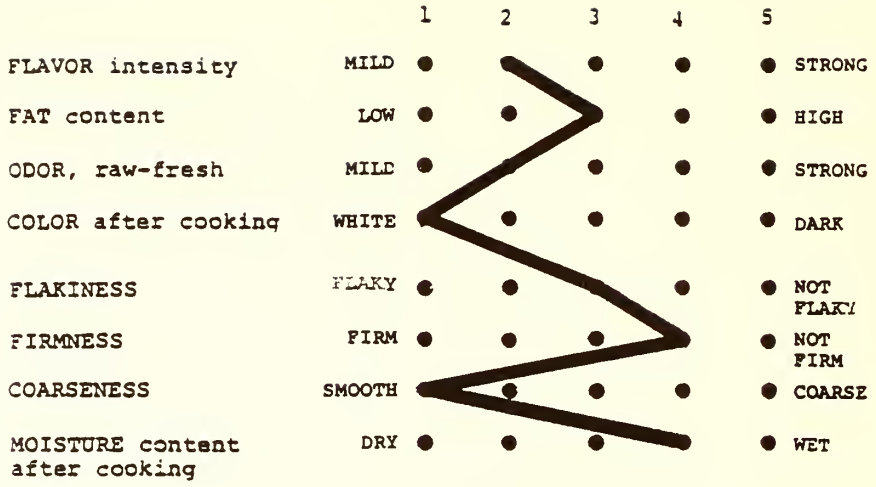
- **BURBOT**

  Lota lota



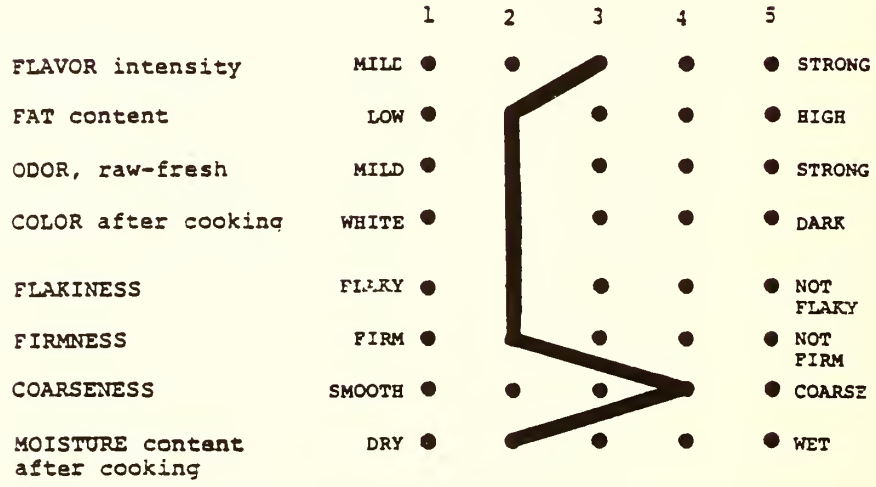
- BUTTERFISH

Poronotus triacanthus



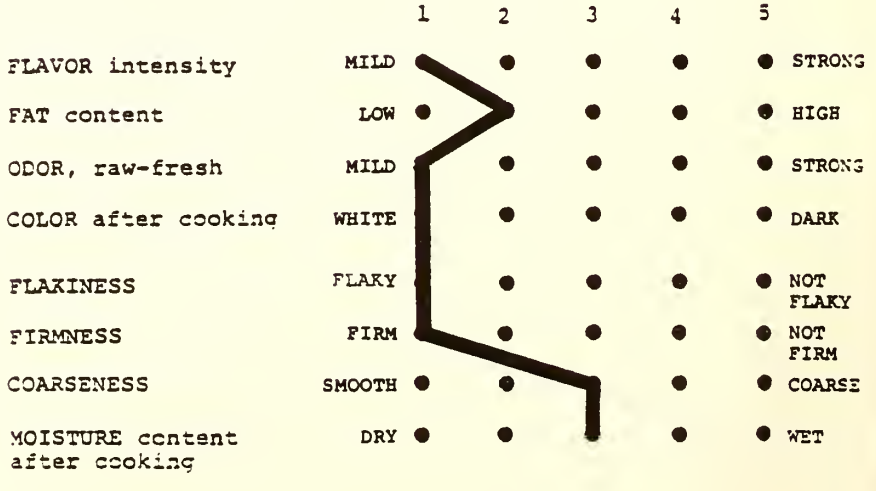
- CABEZON

Scorpaenichthys marmoratus



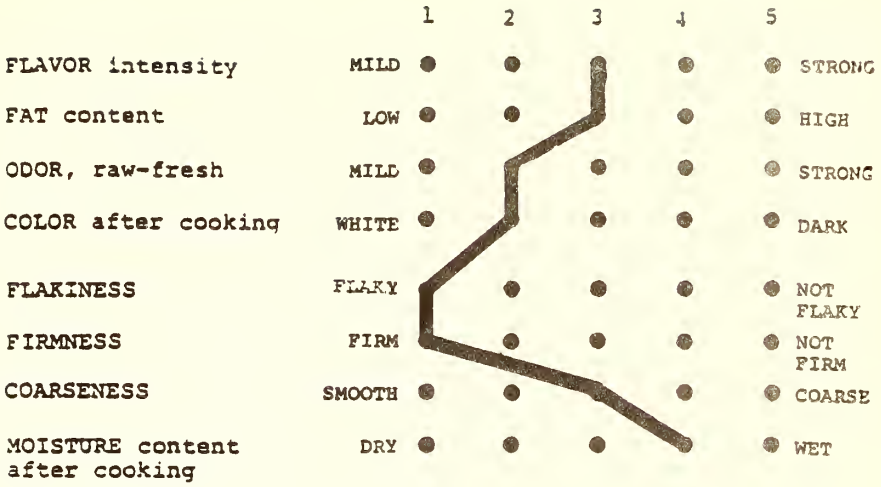
- Spotted CABRILLA

Epinephelus analogus



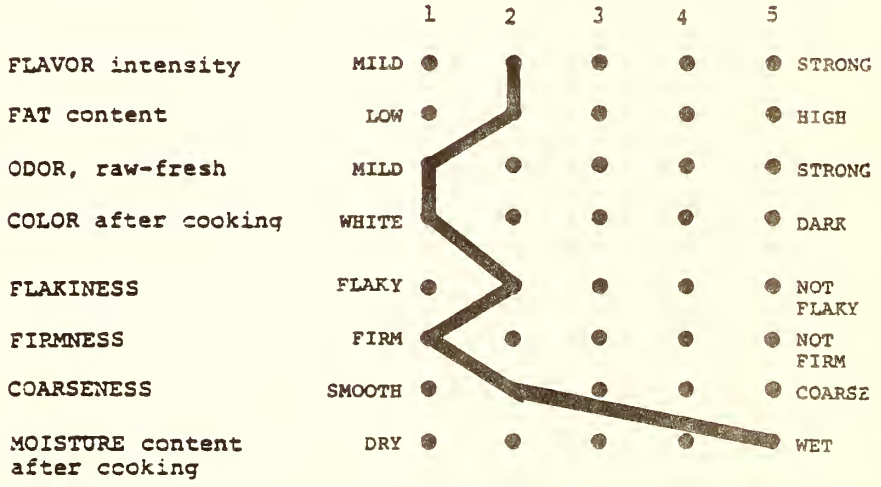
- CARP

Cyprinus carpio



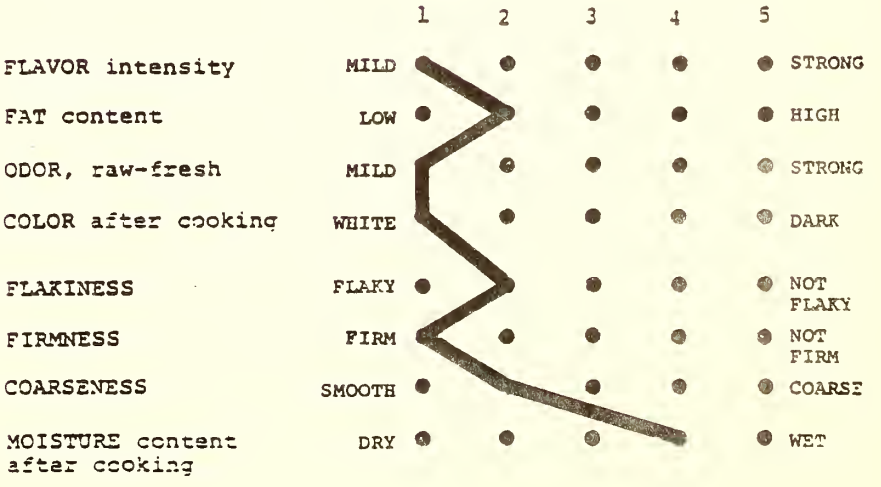
- Blue CATFISH

Ictalurus furcatus



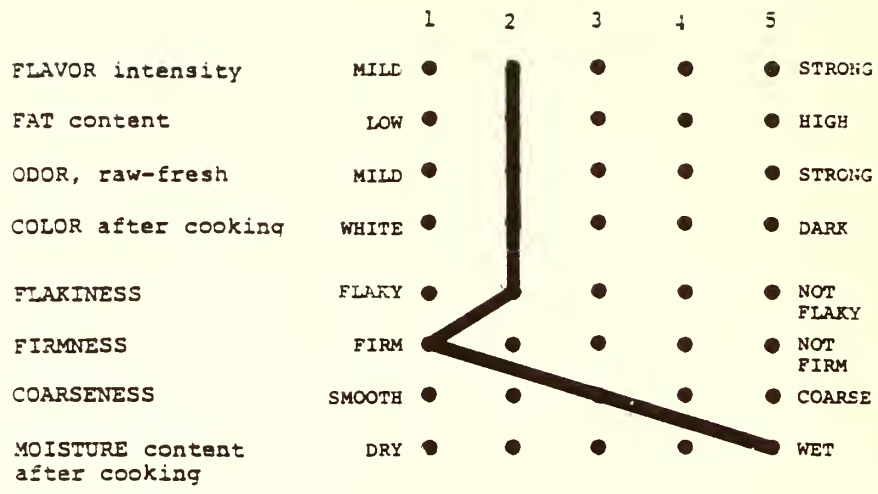
- Channel CATFISH

Ictalurus punctatus



- Sea CATFISH

  Galeichthys felis

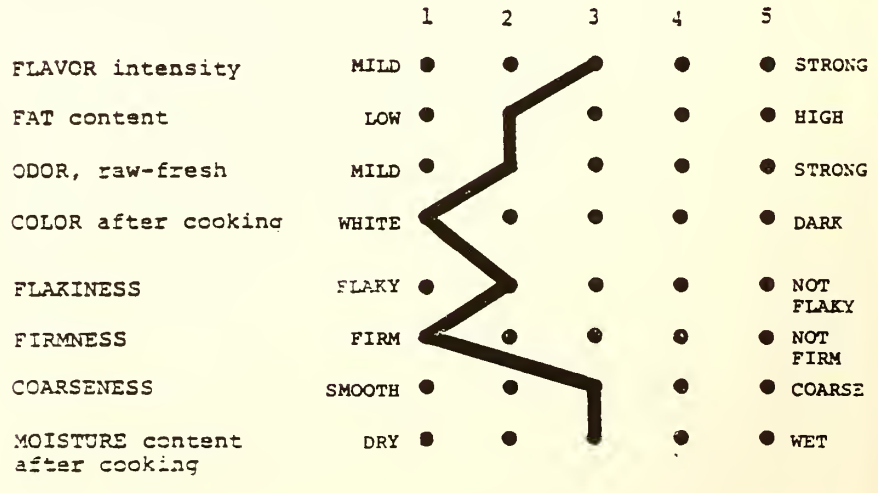


- Lake CHUB

  Hybopsis plumbeua

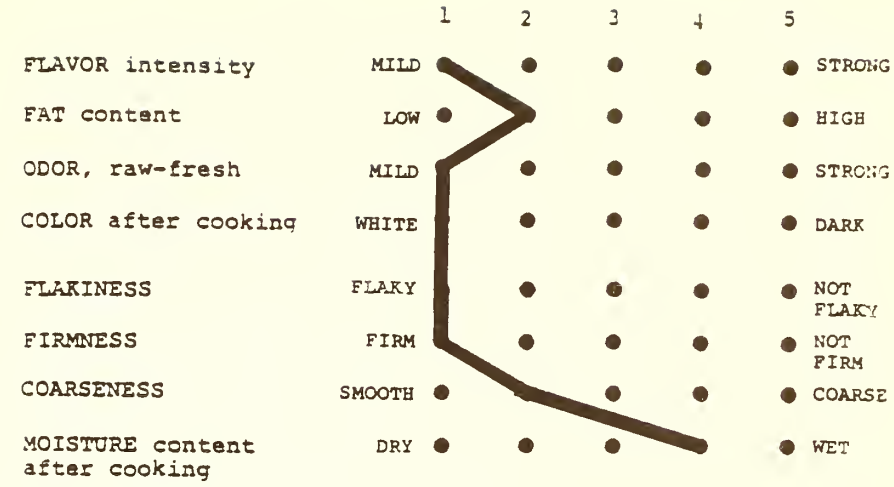
- COBIA
  (Crabeater)

  Rachycentron canadum



Atlantic COD

Gadus morhua

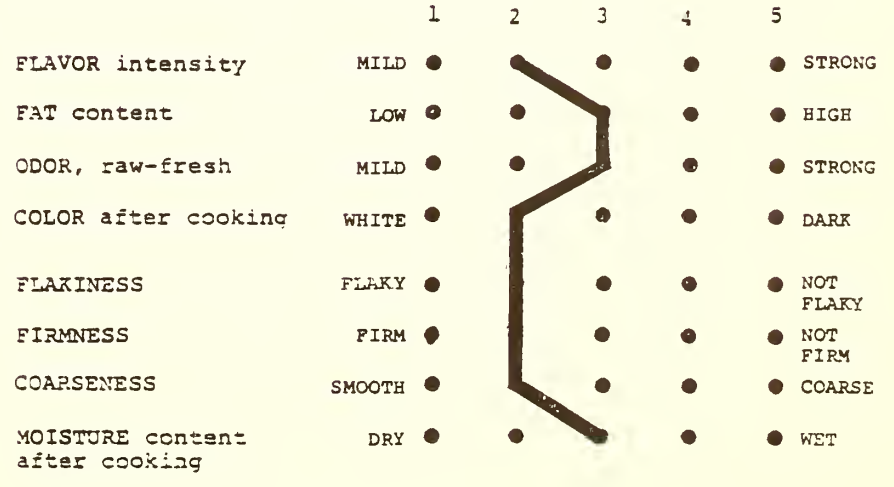


White CRAPPIE

Pomoxis annularis

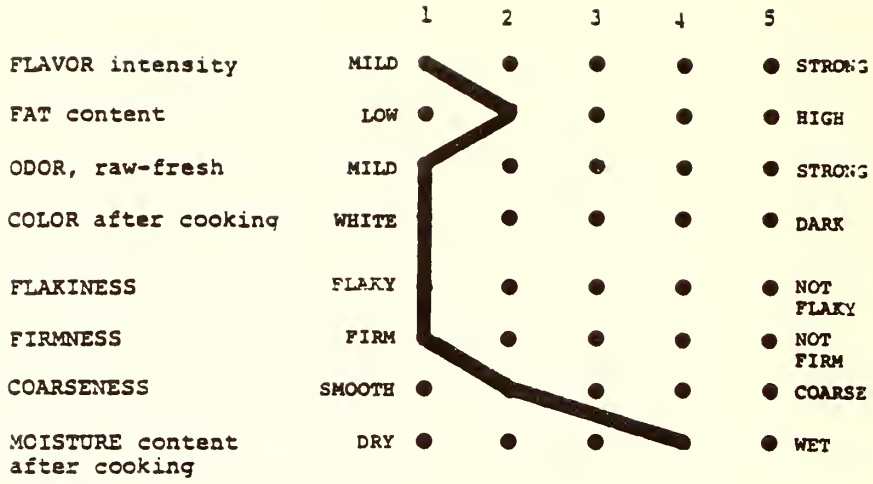
Atlantic CROAKER

Micropogon undulatus



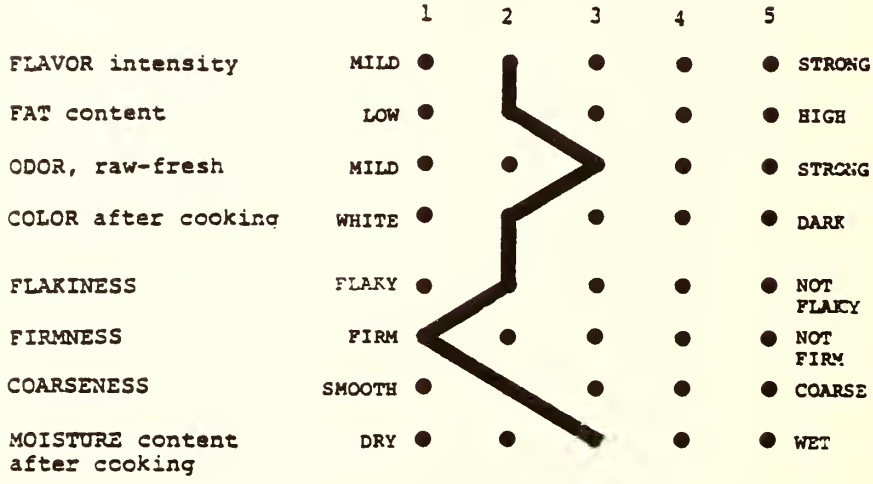
CUSK

Brosme brosme



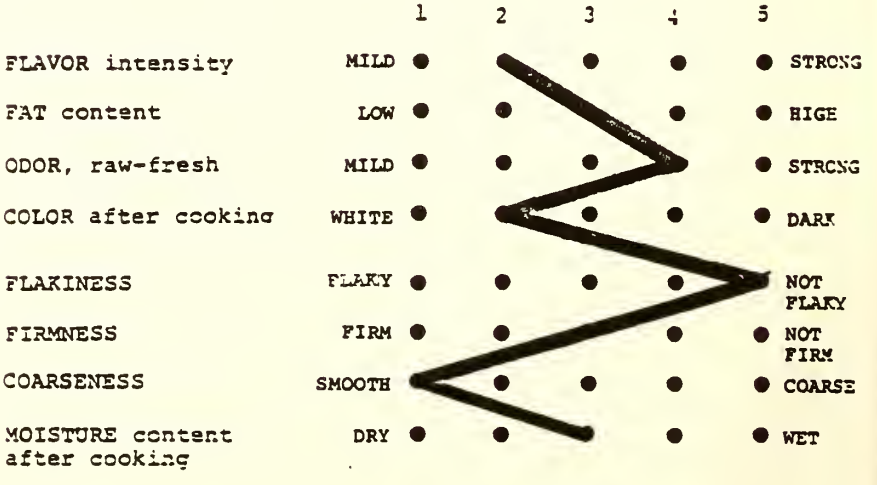
Black DOGFISH

Centroscyllium fabricii



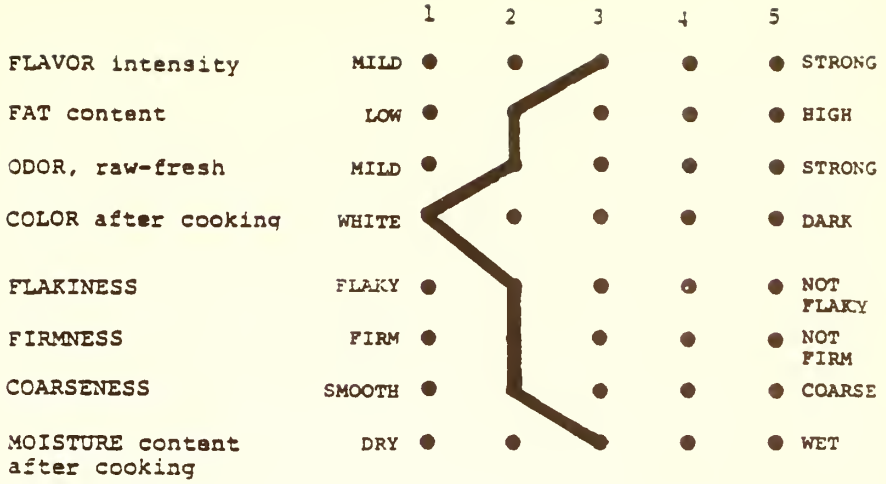
Spiny DOGFISH

Squalus acanthias



- Common DOLPHIN
(Dorado)

Coryphaena hippurus

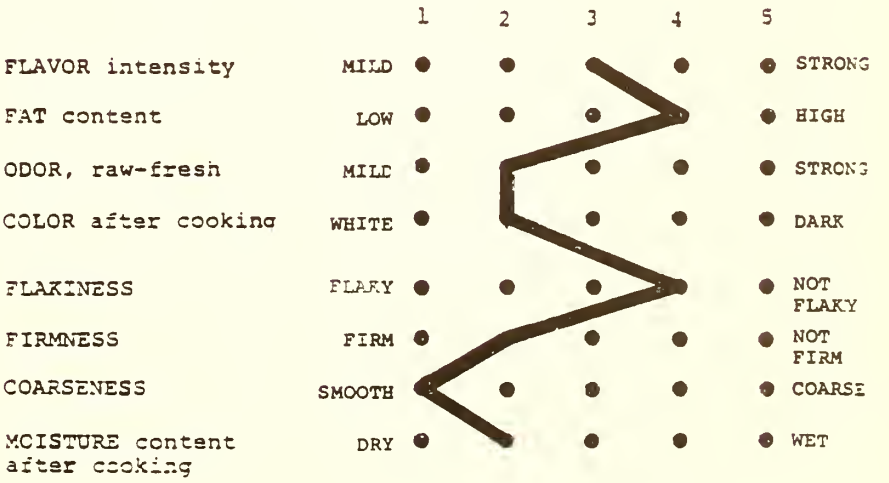


- Black DRUM

Pogonias cromis

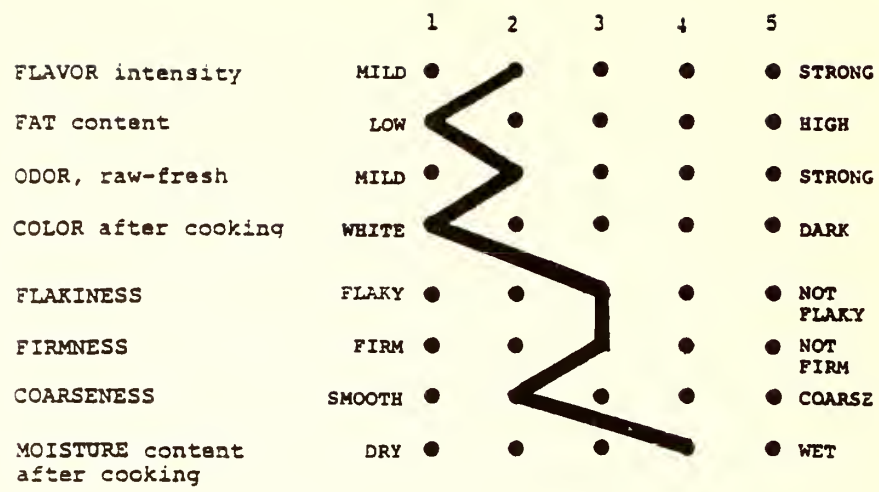
- American EEL
(Silver Eel)

Anguilla rostrata



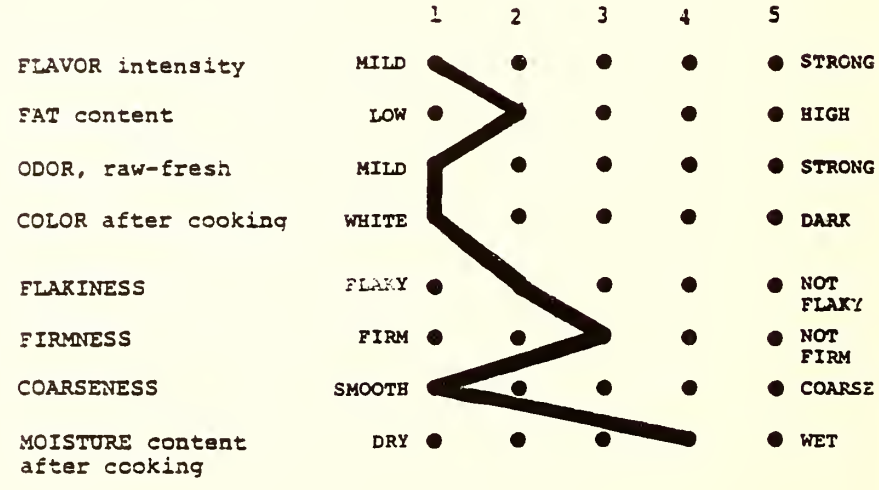
- Arrowtooth FLOUNDER

  Atheresthes stomias



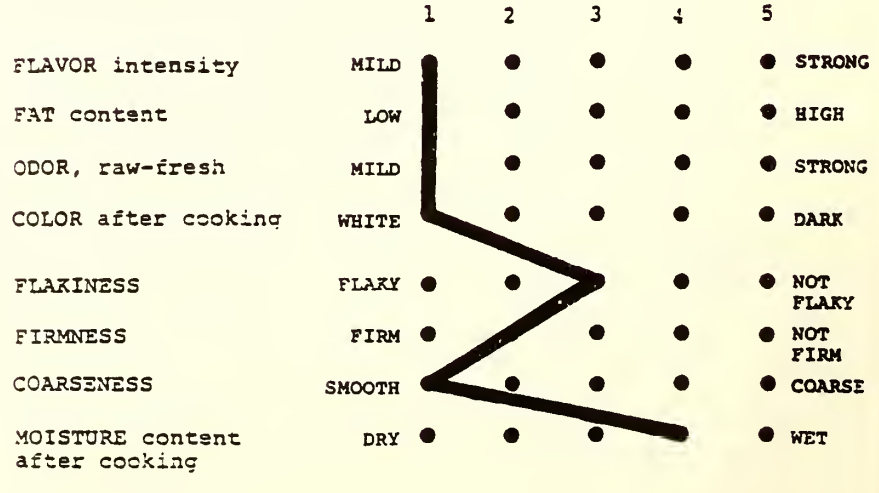
- Southern FLOUNDER

  Paralichthys lethostigma



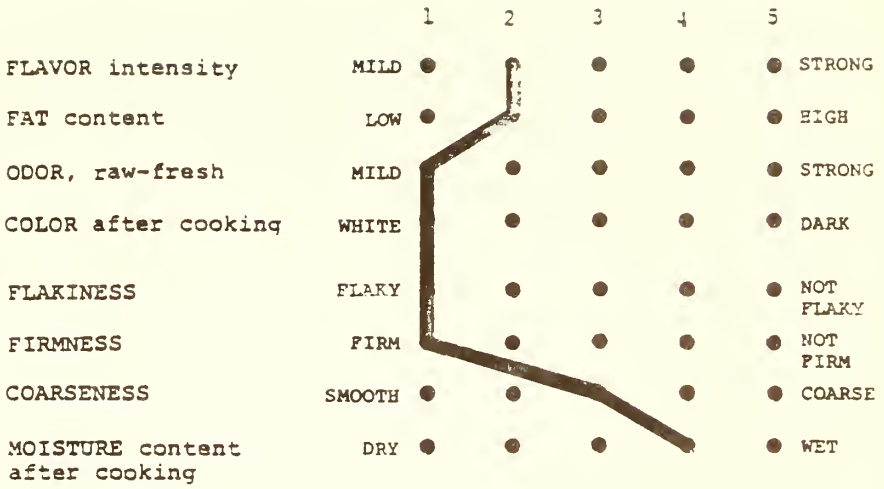
- Summer FLOUNDER (Fluke)

  Paralichthys dentatus



- GAG

Mycteroperca microlepis

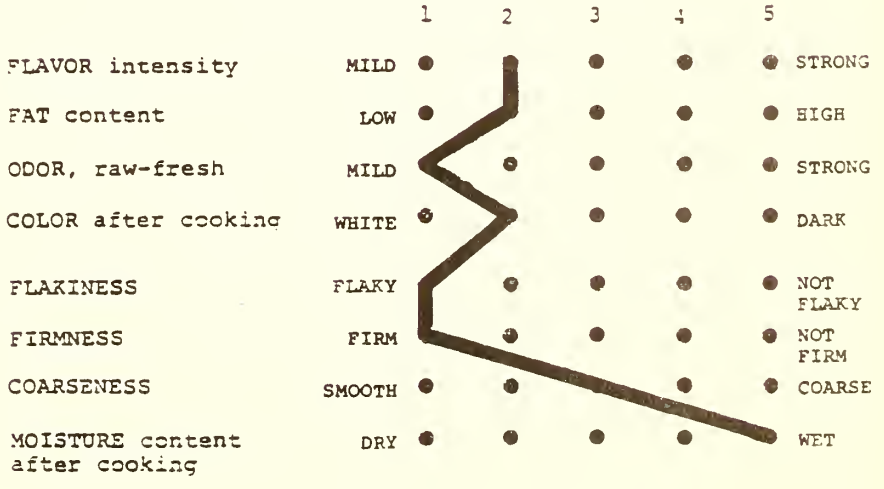


- Black GROUPER

Mycteroperca bonaci

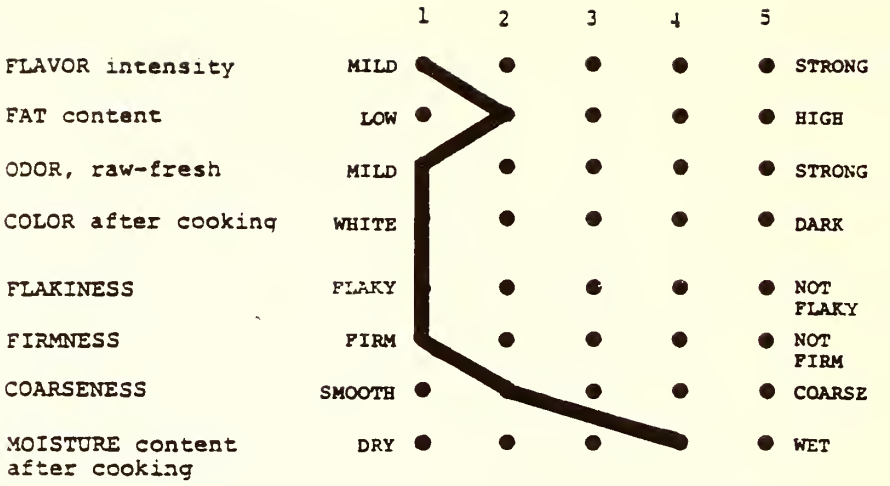
- Nassau GROUPER

Epinephelus striatus



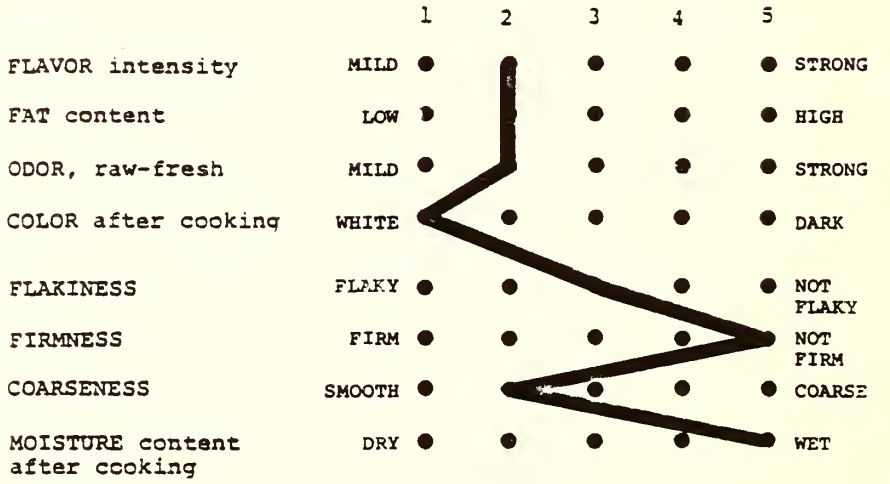
- HADDOCK

Melanogrammus aeglefinus



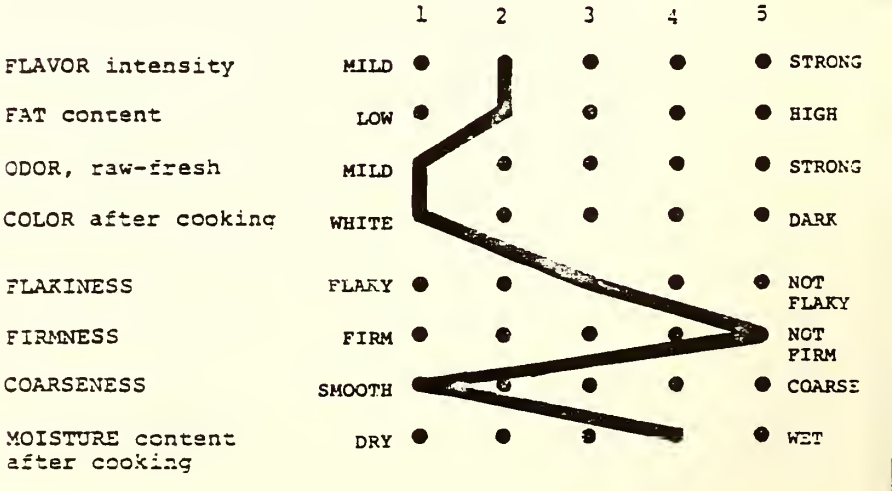
- Pacific HAKE

Merluccius productus



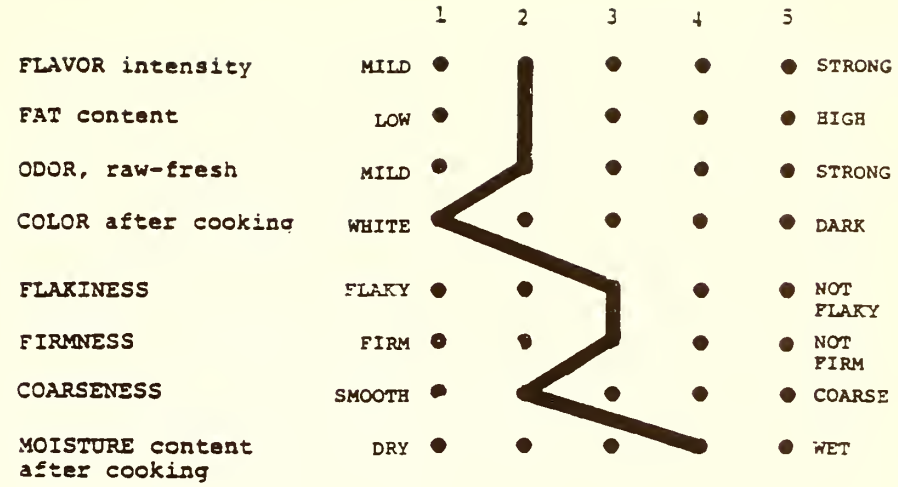
- Red HAKE

Urophycis chuss



- Silver HAKE

Merluccius bilinearis

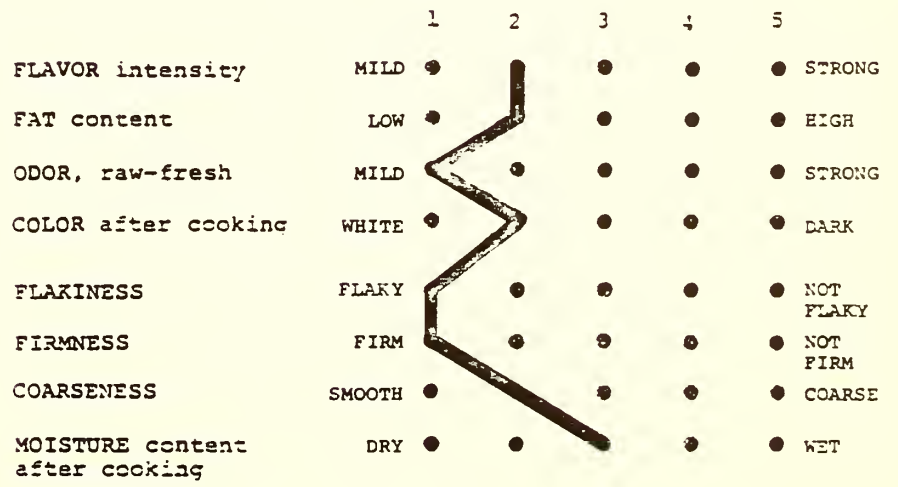


- White HAKE

Urophycis tenuis

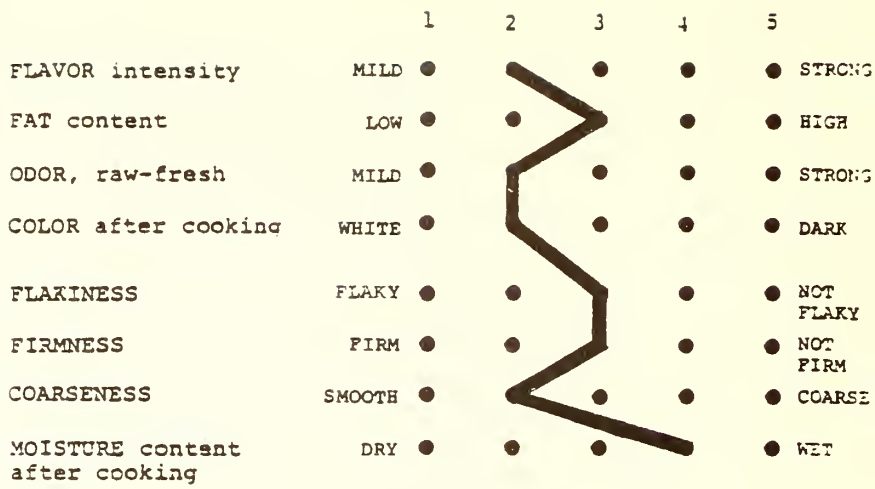
- Atlantic HALIBUT

Hippoglossus hippoglossus



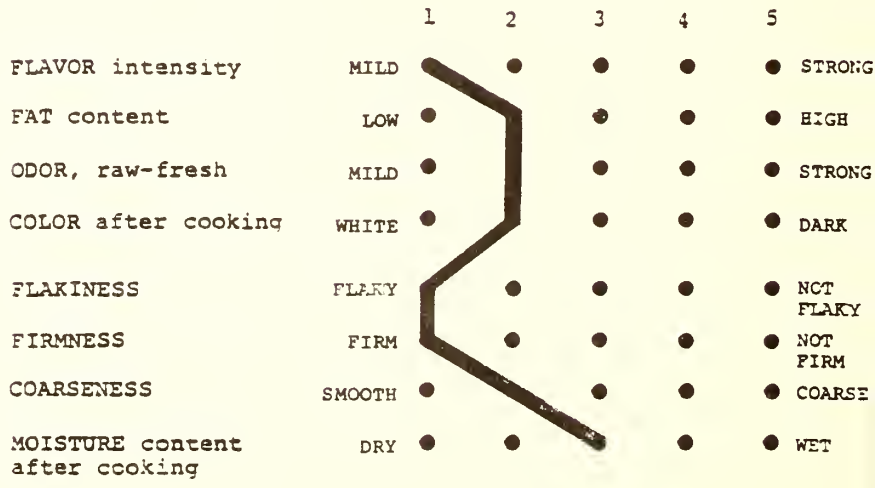
- Greenland TURBOT
  (Greenland Halibut)

  Reinhardtius
  hippoglossoides



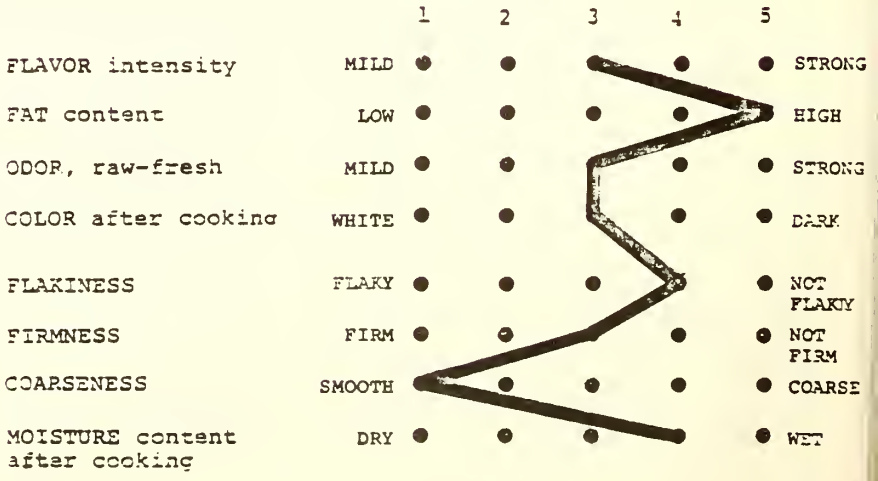
- Pacific HALIBUT

  Hippoglossus stenolepis



- Atlantic HERRING

  Clupea harengus
  harengus

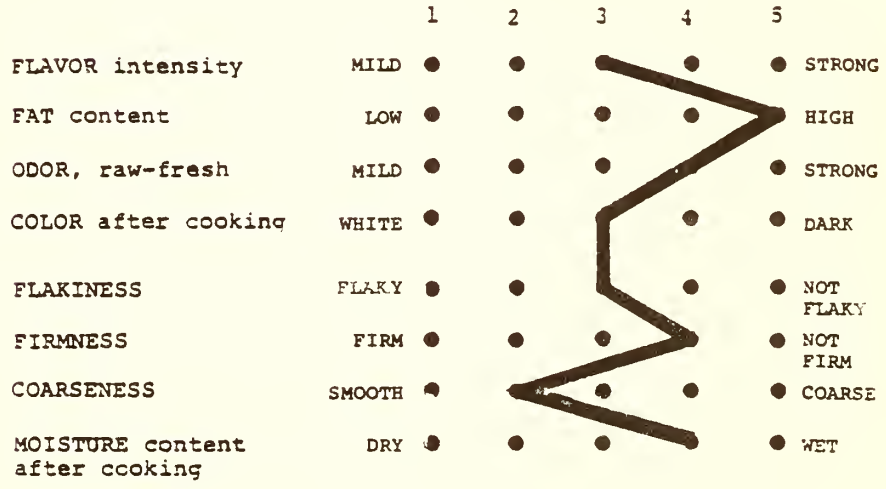


- Lake HERRING
(Cisco)

Coregonus artedii

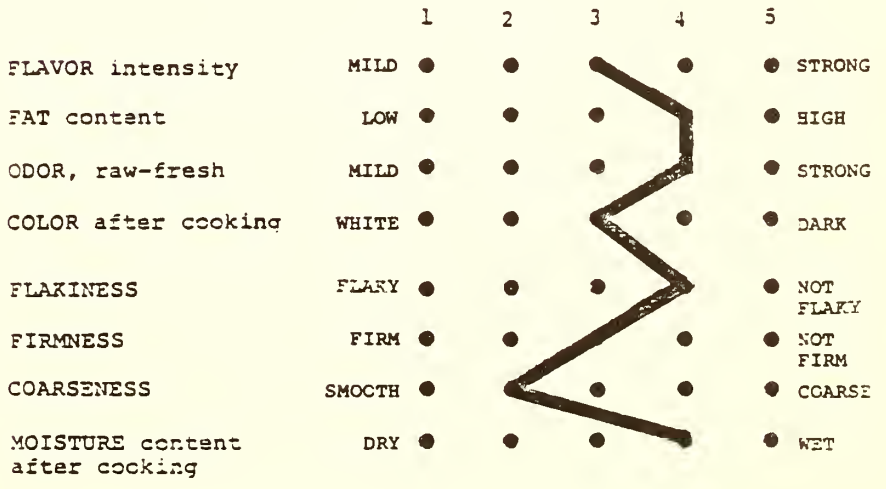
- Pacific HERRING

Clupea harengus pallasi



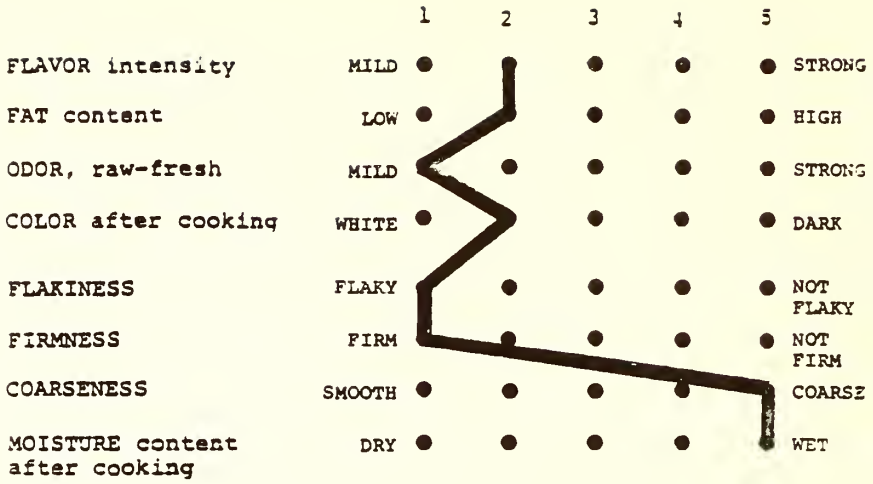
- Crevalle JACK
(Common Jack)

Caranx hippos



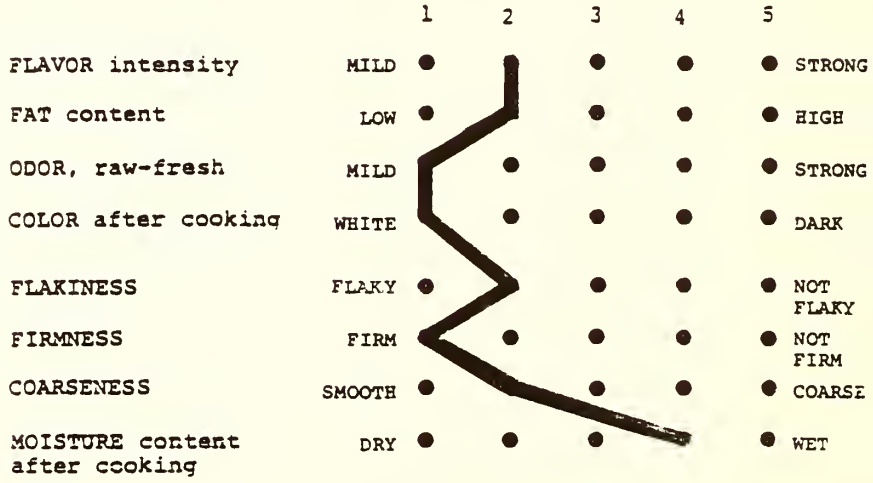
- JEWFISH
(Spotted Grouper)

Epinephelus itajara



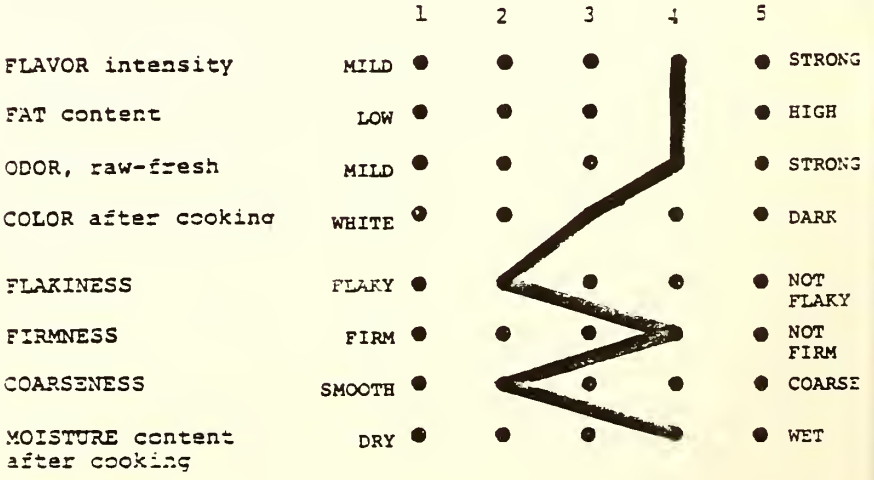
- LINGCOD

Ophidon elongatus



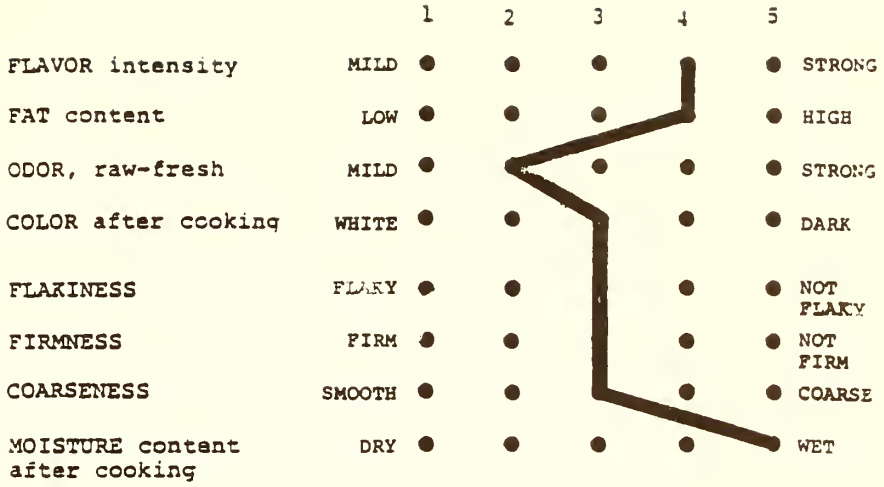
- Atlantic MACKEREL

Scomber scombrus



- Jack MACKEREL

Trachurus symmetricus

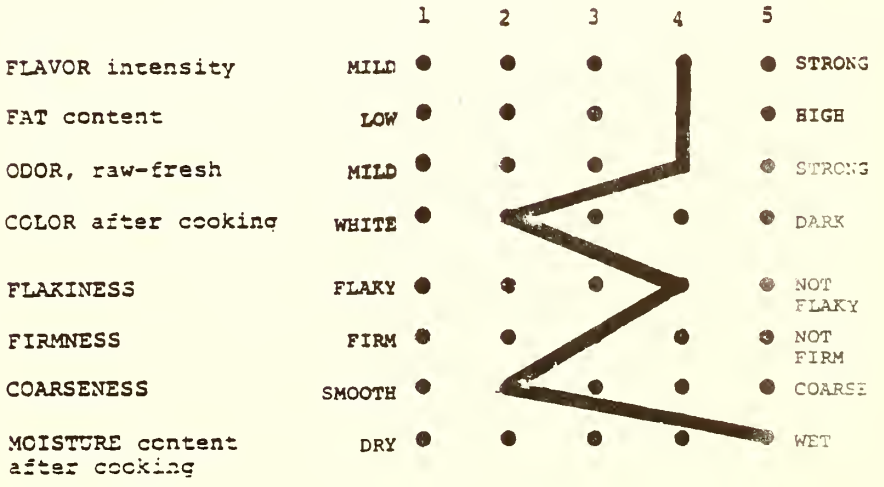


- King MACKEREL (Kingfish)

Scomberomorus cavalla

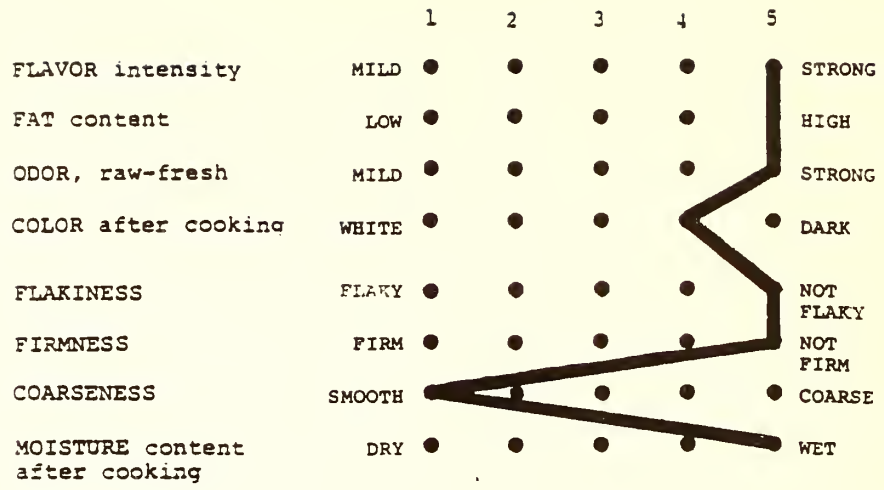
- Spanish MACKEREL (Spotted Mackerel)

Scomberomorus maculatus



- Atlantic MENHADEN

  Brevoortia tyrannus

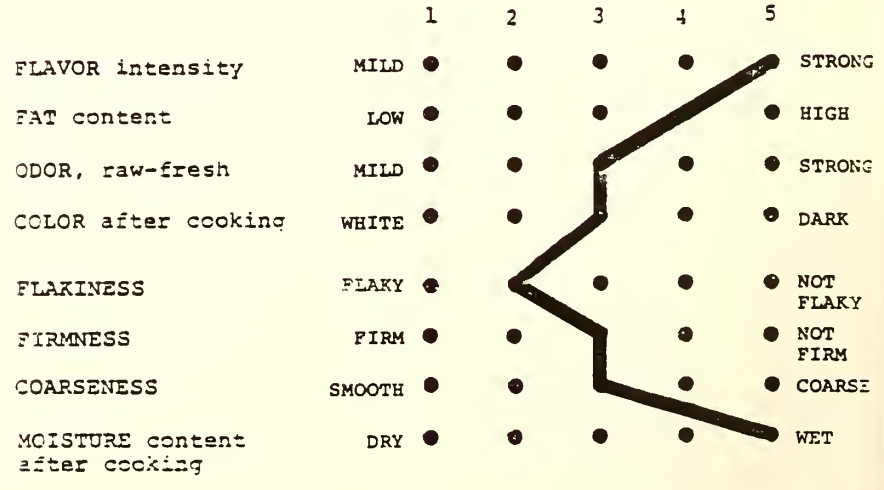


- MONKFISH

  Lophius americanus

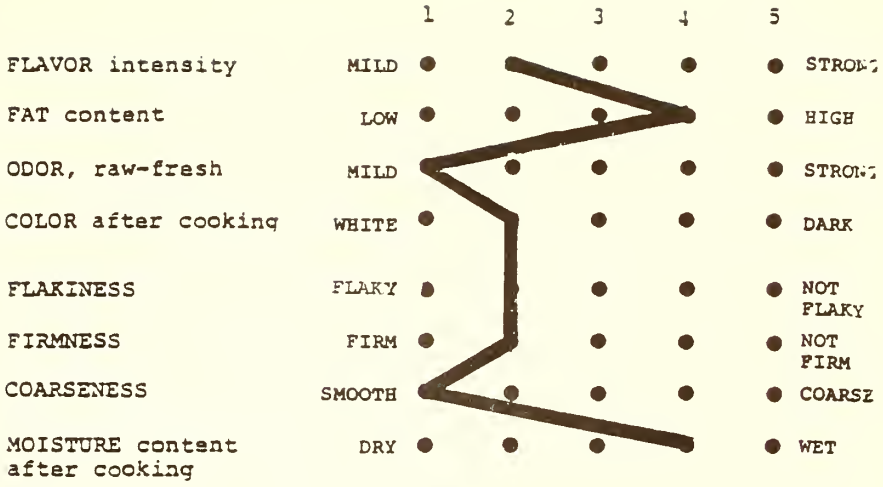
- Redeye MULLET
  (Silver Mullet)

  Mugil gaimardiana



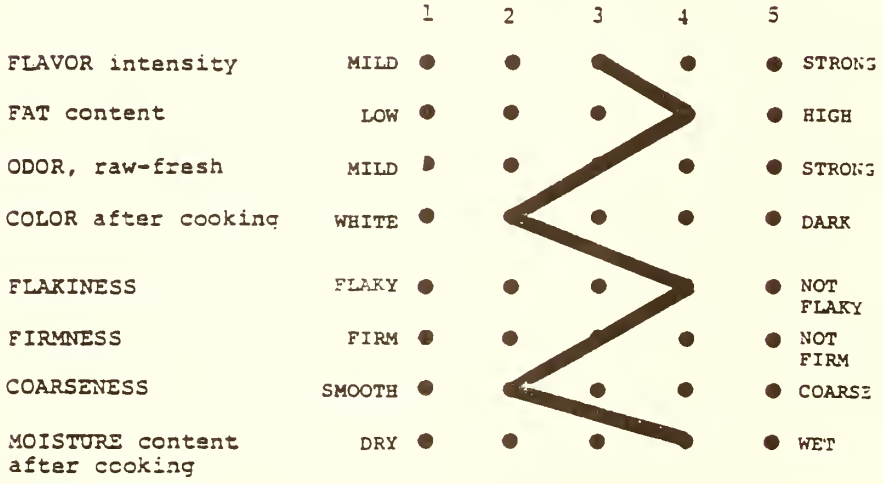
- Striped MULLET

Mugil cephalus



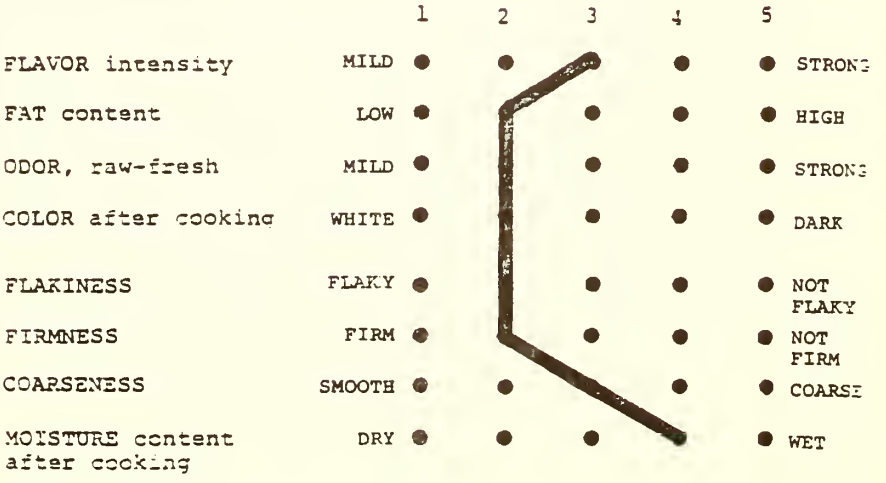
- White MULLET

Mugil cerema



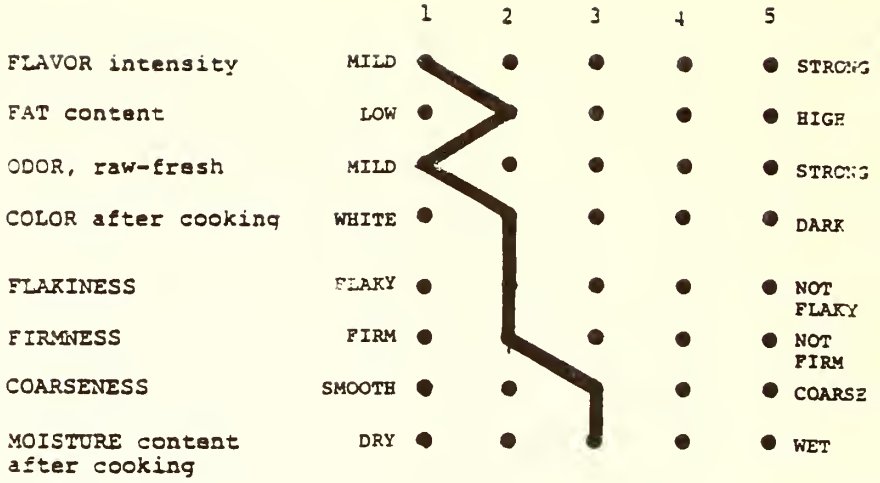
- Atlantic Ocean PERCH (Rosefish or Redfish)

Sabastes marinus



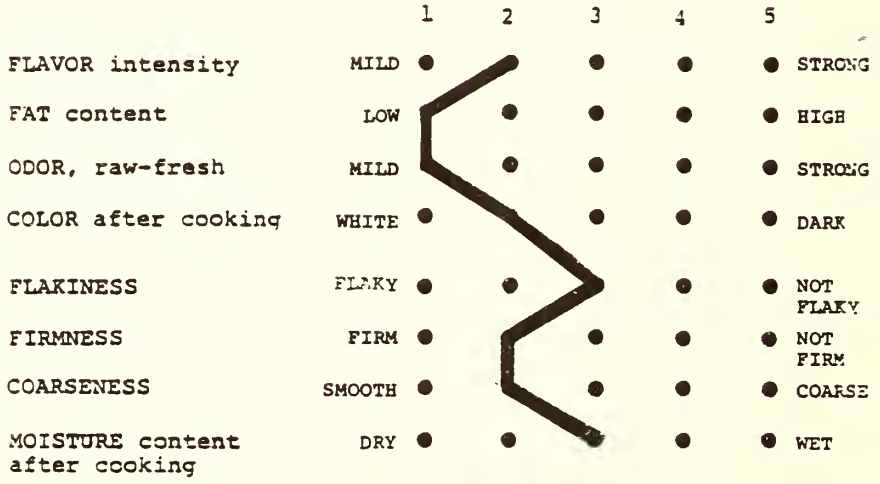
- Pacific Ocean PERCH

Sebastodes alutus



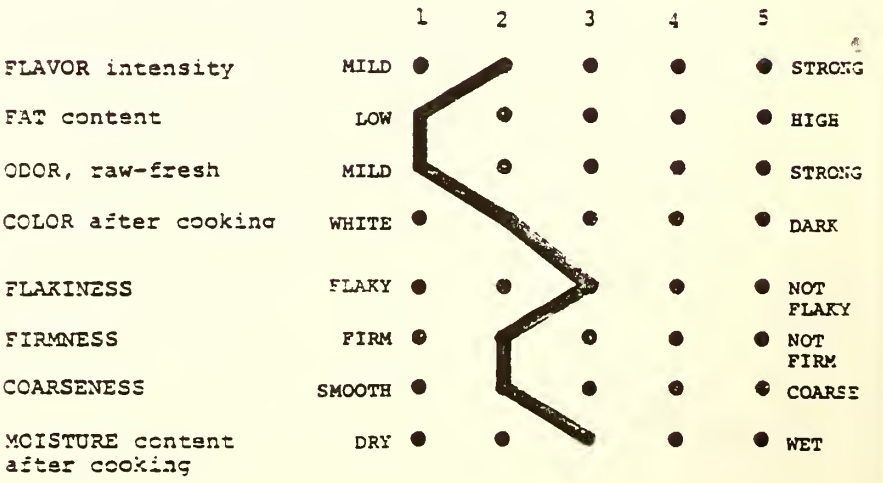
- White PERCH

Morone (Roccus) americana



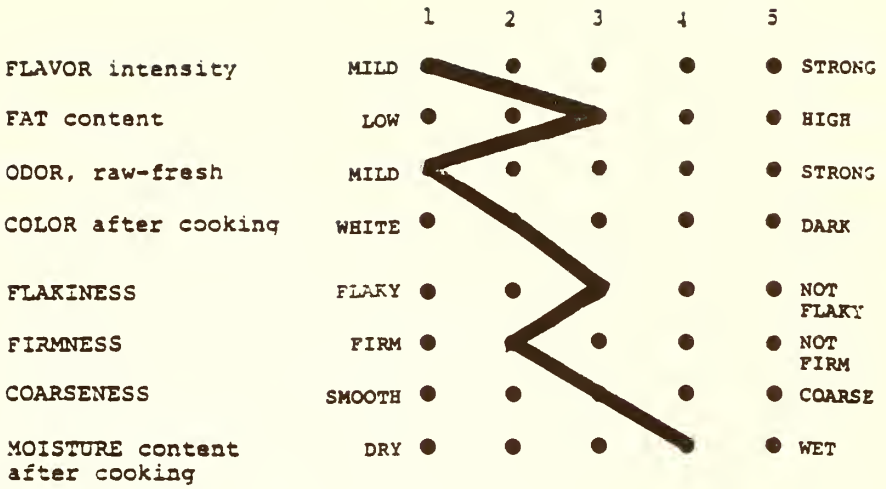
- Yellow PERCH

Perca flavascens



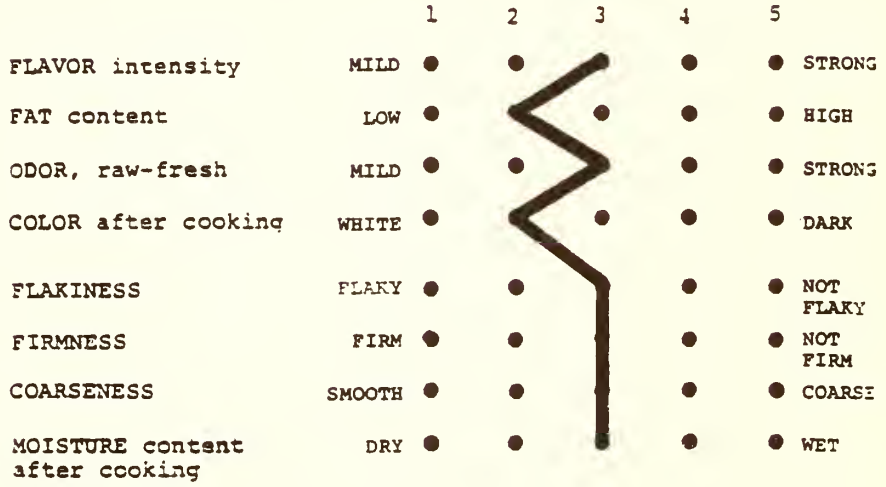
- PIGFISH

Orthopristis chrysopters



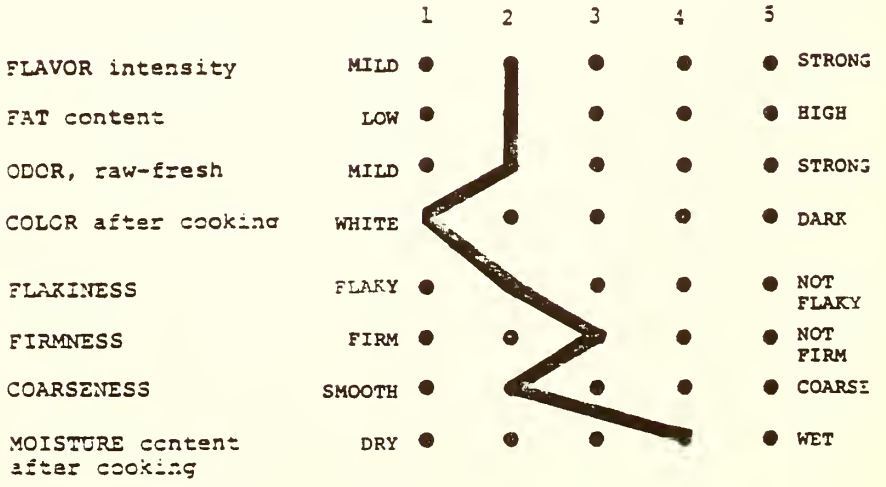
- Northern PIKE

Esox lucius



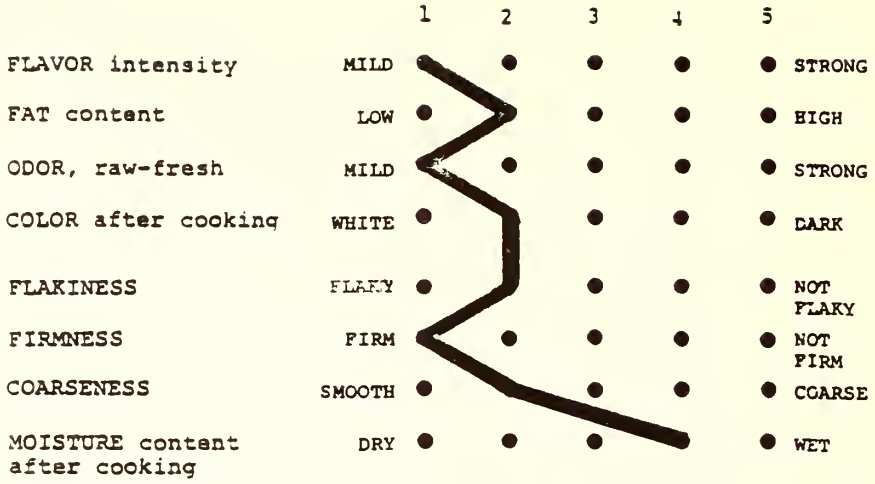
- American PLAICE

Hippoglossoides platessoides



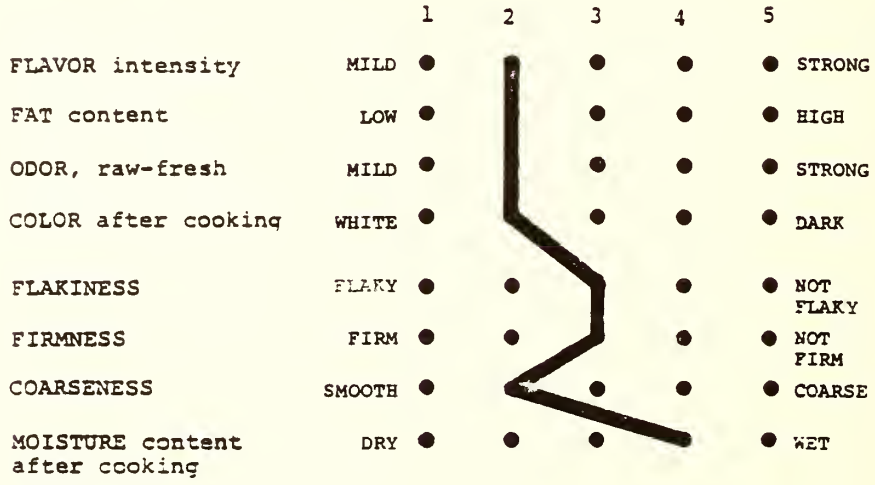
- Alaska POLLOCK
  (Walleye Pollack)

  Theragra chalcogramma



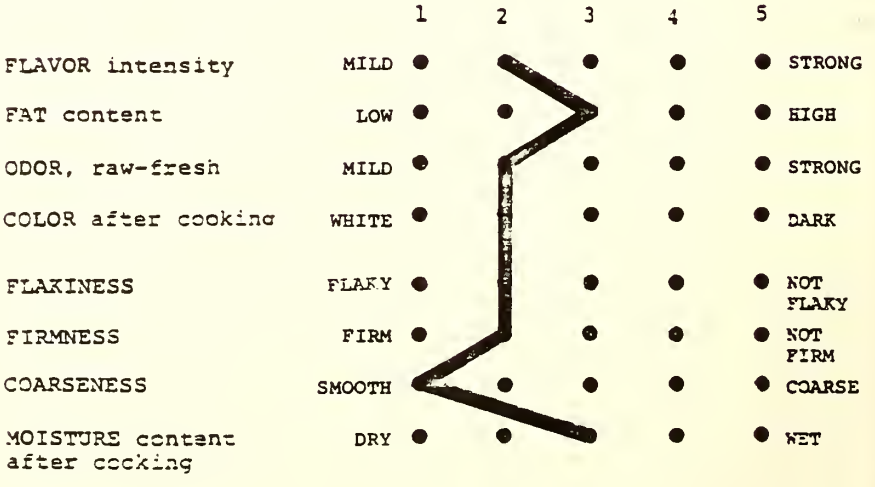
- Pacific POLLOCK

  Pollachius virens



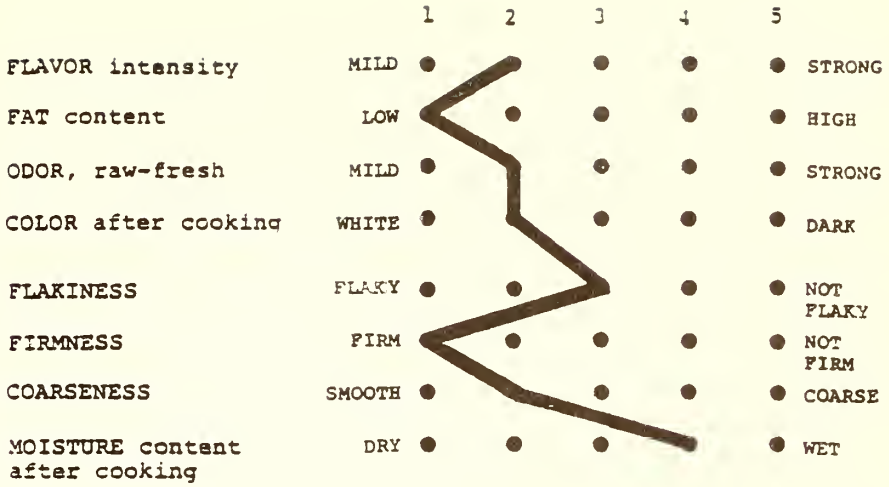
- Florida POMPANO

  Trachinotus carolinus



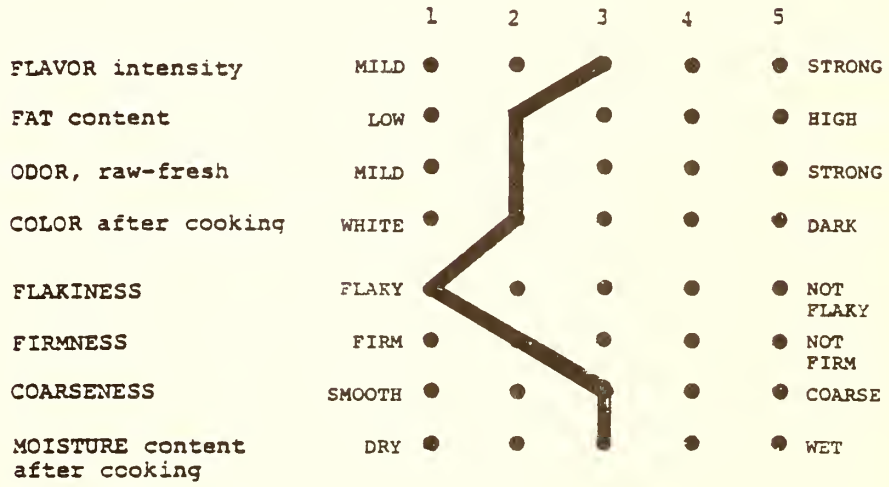
- Ocean POUT

Macrozoarces americanus



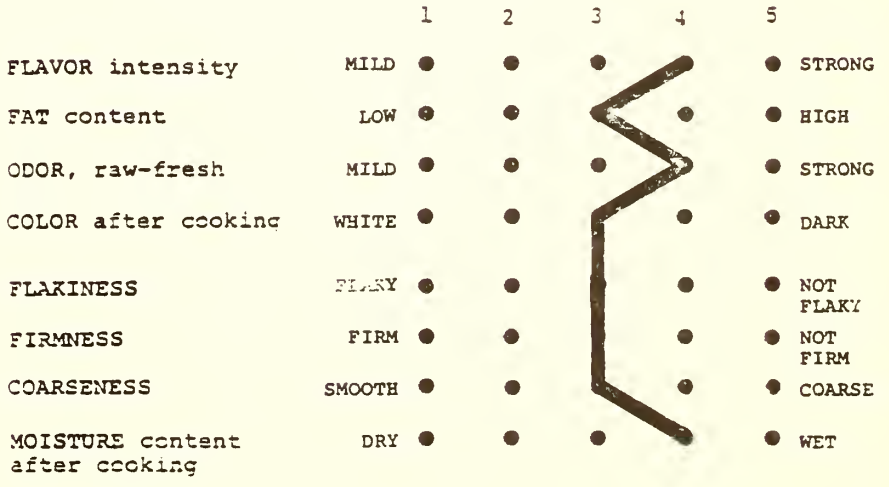
- ROCKFISH

Sebastodes species



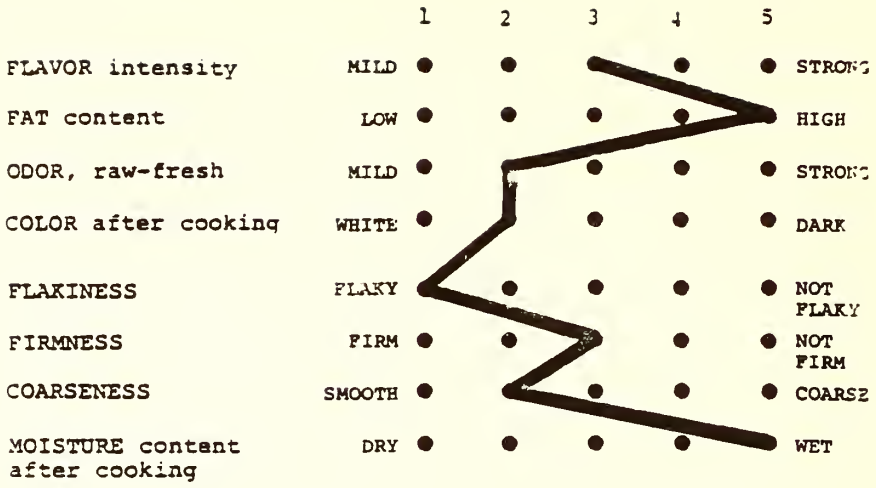
- Blue RUNNER

Caranx crysos



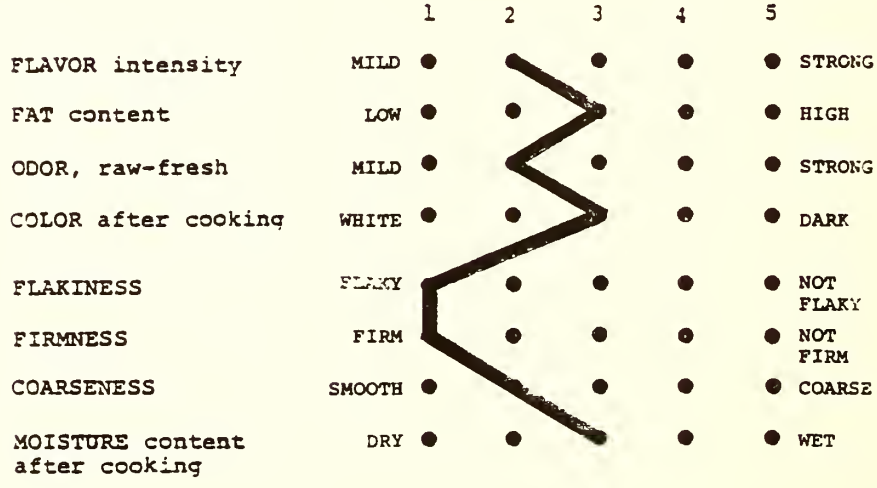
- SABLEFISH

Anoplopoma fimbria



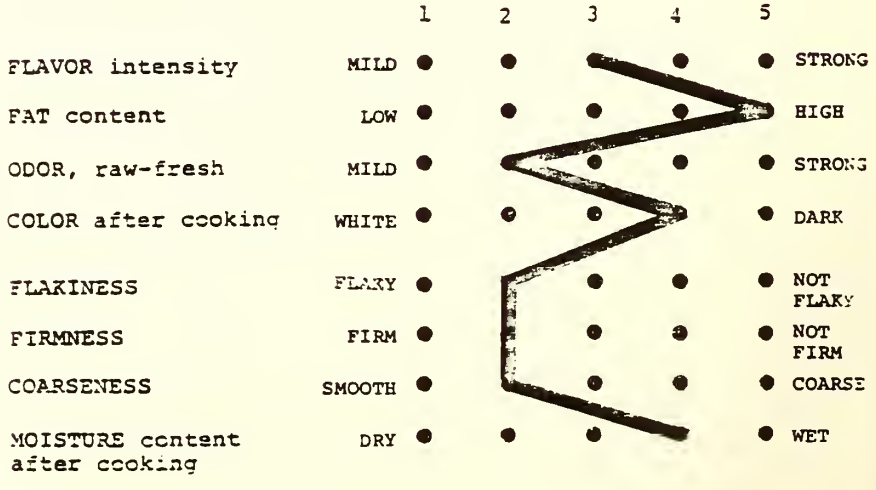
- Atlantic SALMON

Salmo salar



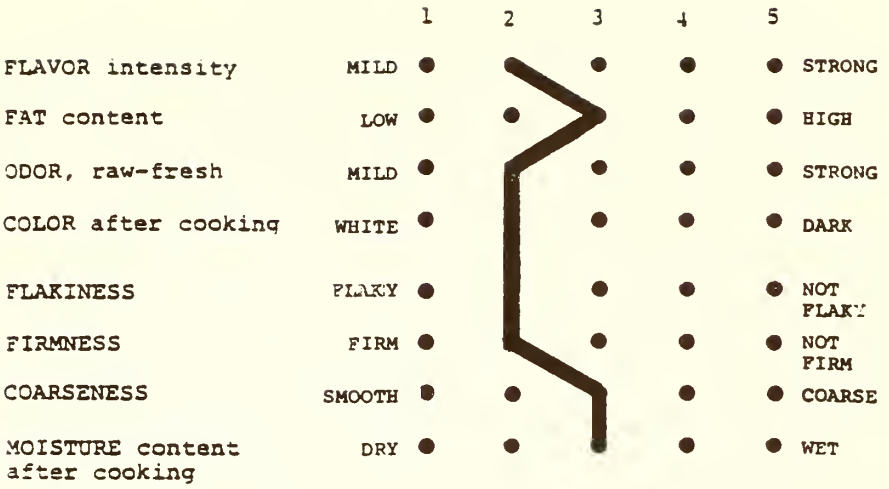
- Chinook SALMON

Oncorhynchus tshawytscha



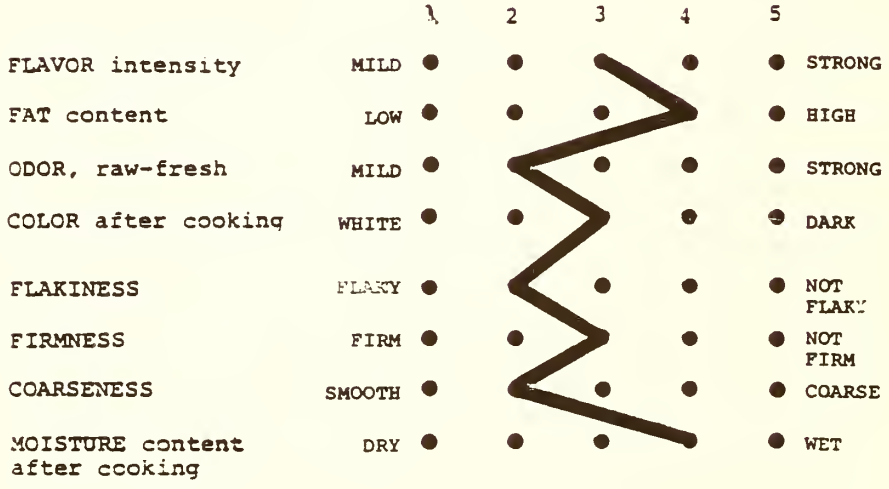
- Chum SALMON

Oncorhynchus keta



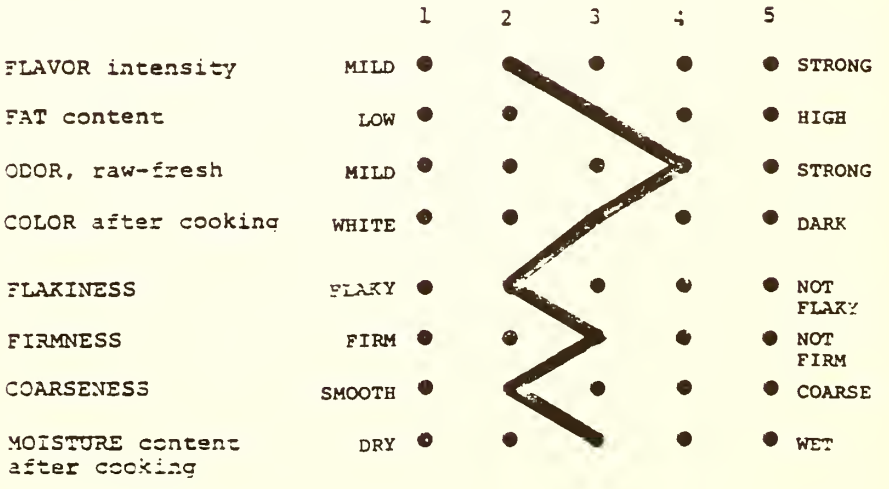
- Coho SALMON

Oncorhynchus kisutch



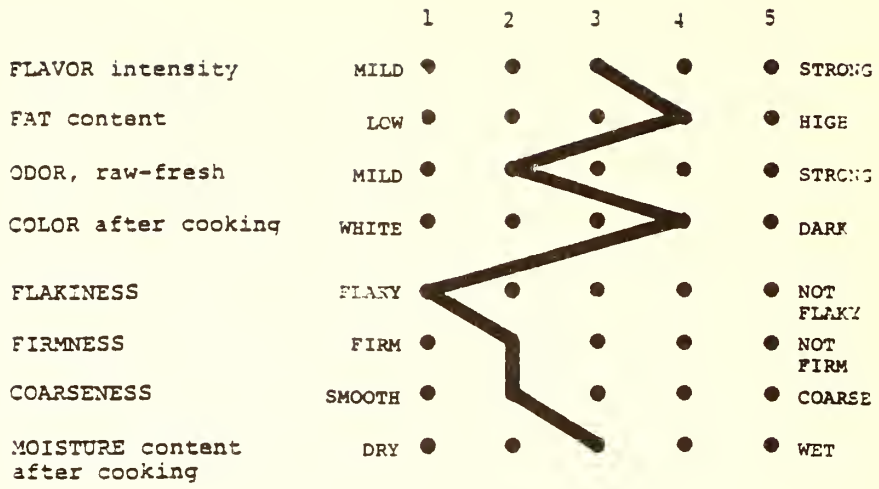
- Pink SALMON

Oncorhynchus gorbuscha



- Sockeye SALMON

Oncorhynchus nerka



- Pacific SANDDAB

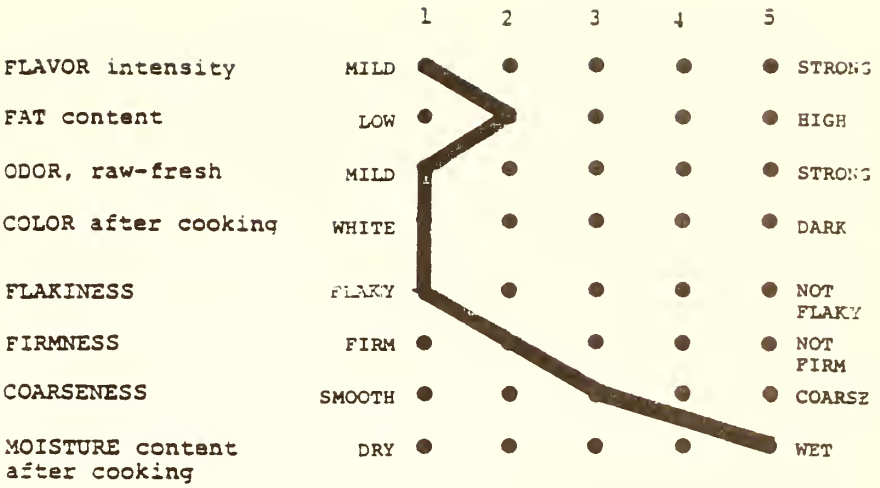
Citharichthys sordious

- SAUGER

Stizostedion canadense

- SCAMP

Mycteroperca phenax

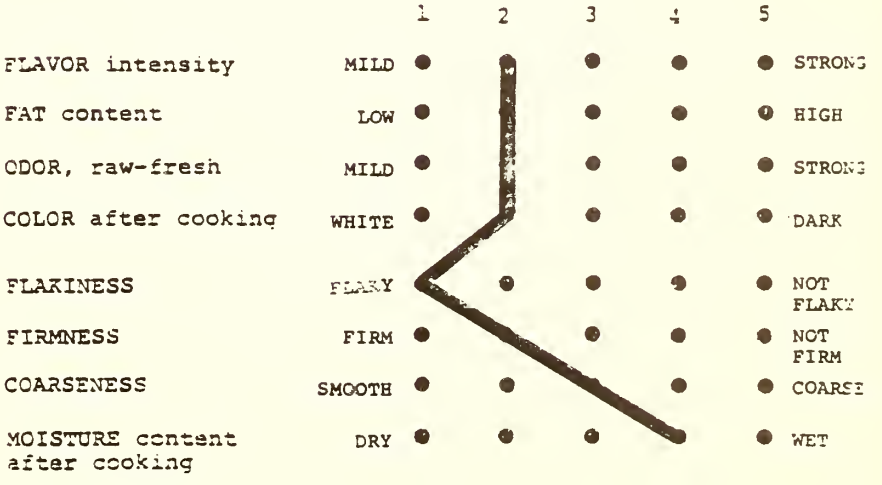


- SCUP

Stenotomus chrysops

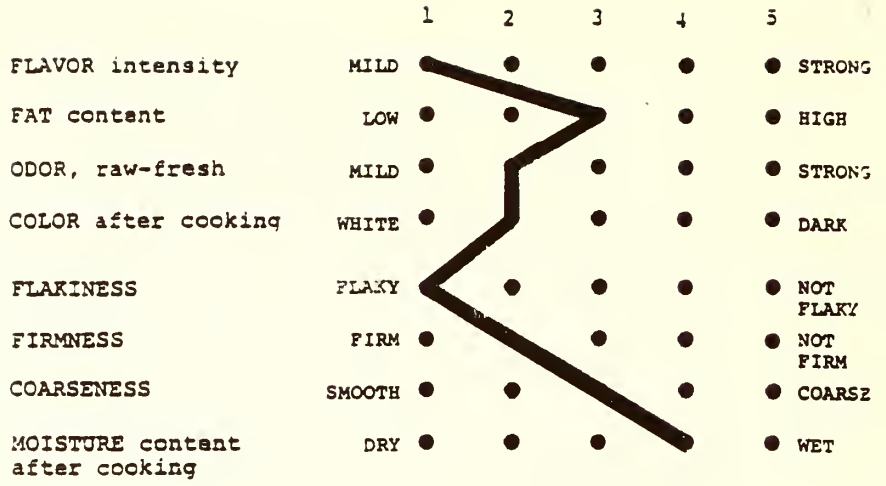
- Black SEA BASS

Centropristas striatus



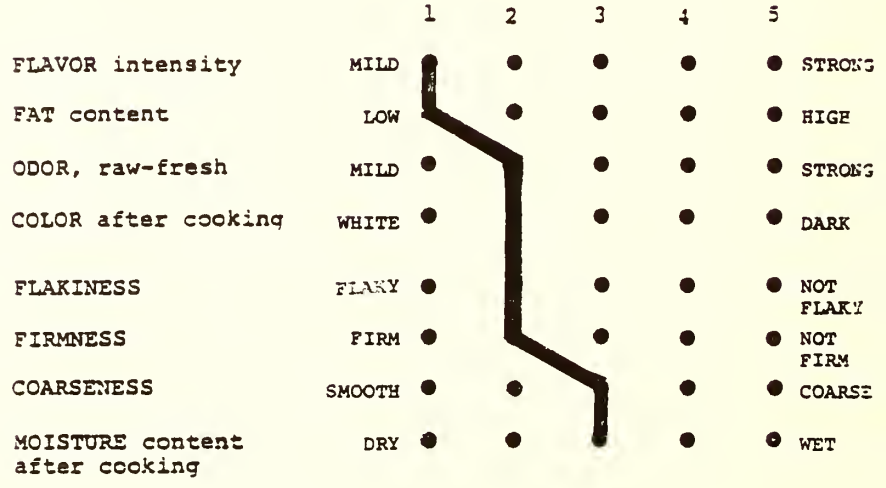
- Giant SEA BASS

  Stereolepis gigas



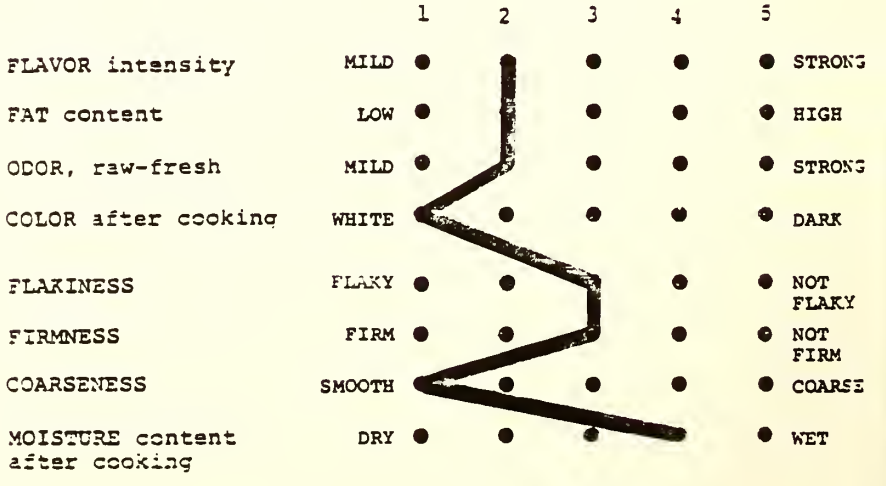
- White SEABASS

  Cynoscion nobilis



- Spotted SEATROUT
  (Speckle Trout)

  Cynoscion nebulosus

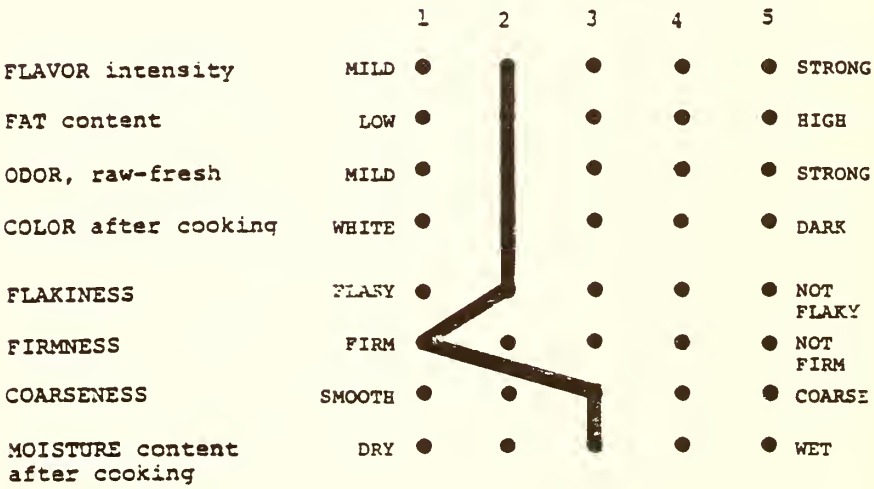


- White SEATROUT
(Sand Seatrout)

Cynoscion arenarius

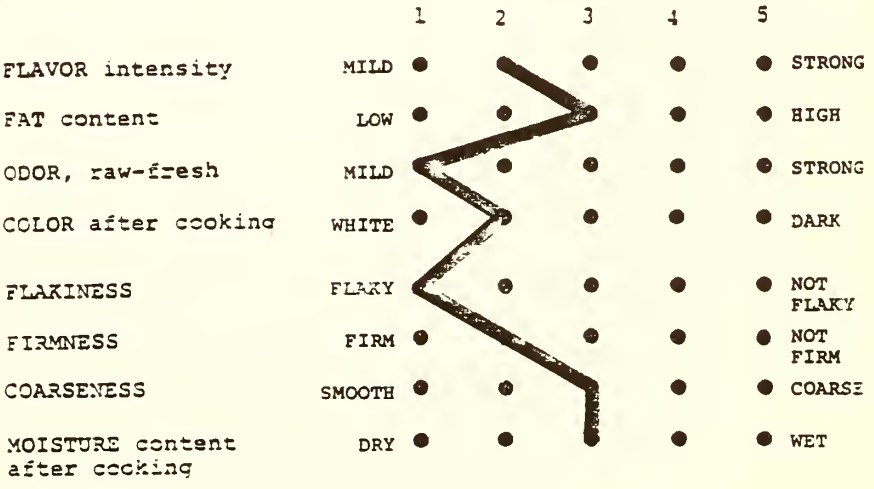
- Sand SHARK
(Ground Shark)

Odontaspis (Carcharias) taurus



- SHEEPSHEAD

Archosargus probatocephalus



- SIERRA

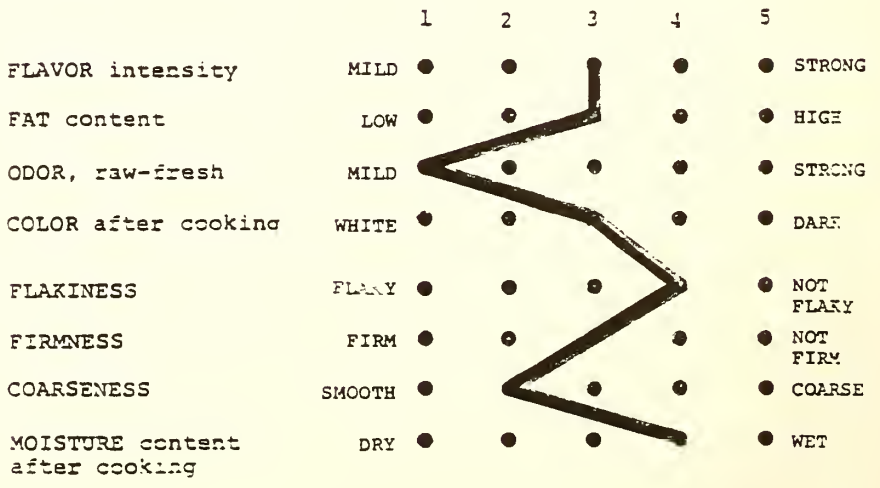
Scomberomorus sierra

- Rainbow SMELT

Osmerus mordax

- Surf SMELT

Hypomesus pretiosus

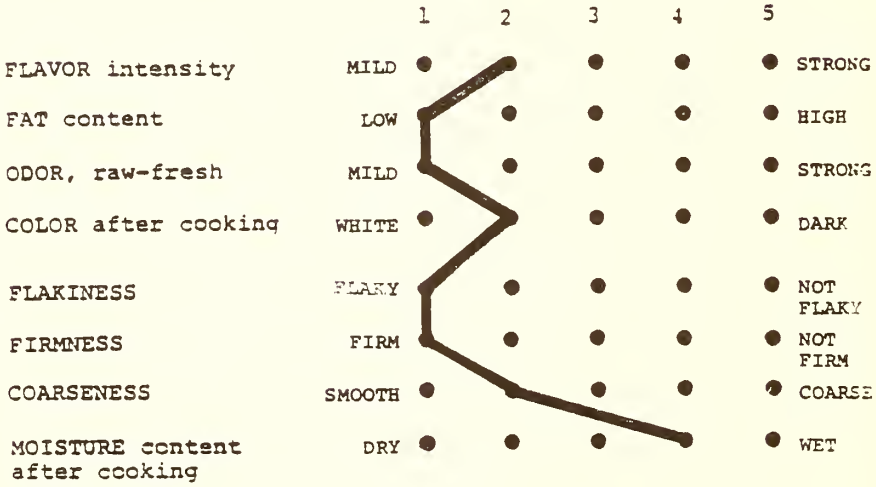


- Red SNAPPER

Lutjanus campechanus (blackfordi)

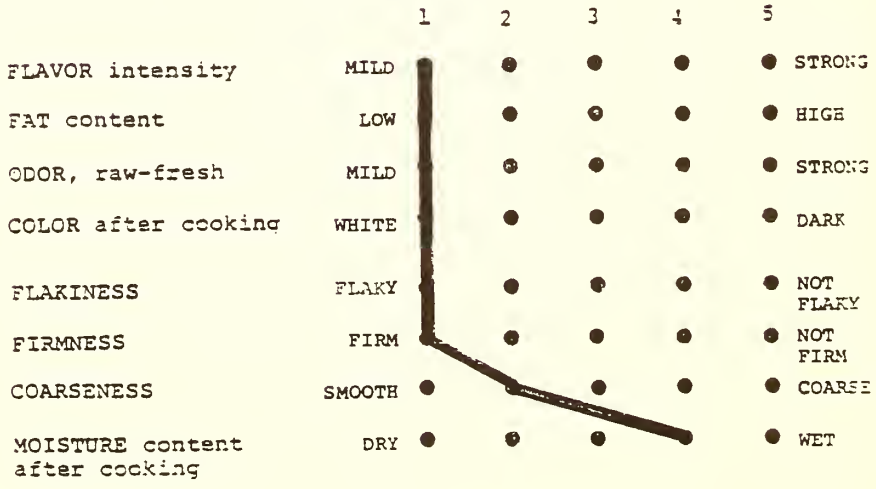
- Vermillion SNAPPER

Rhomboplites aurorubens



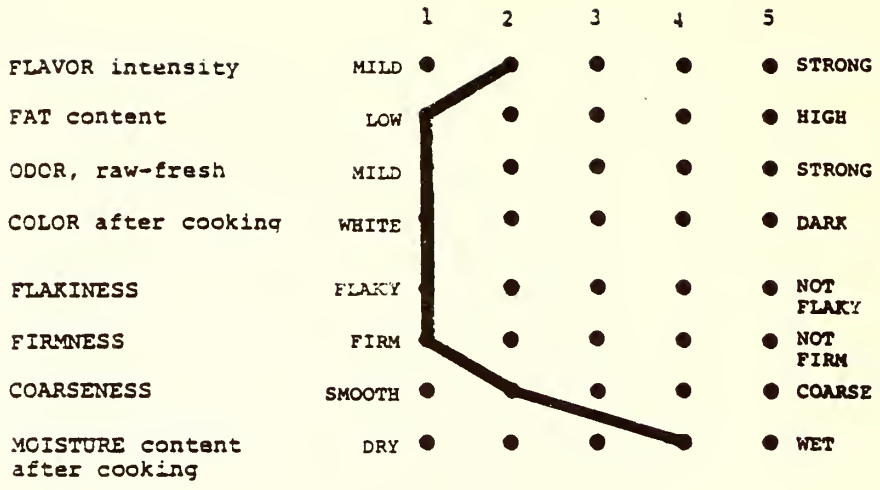
- Yellowtail SNAPPER

Ocyurus chrysurus



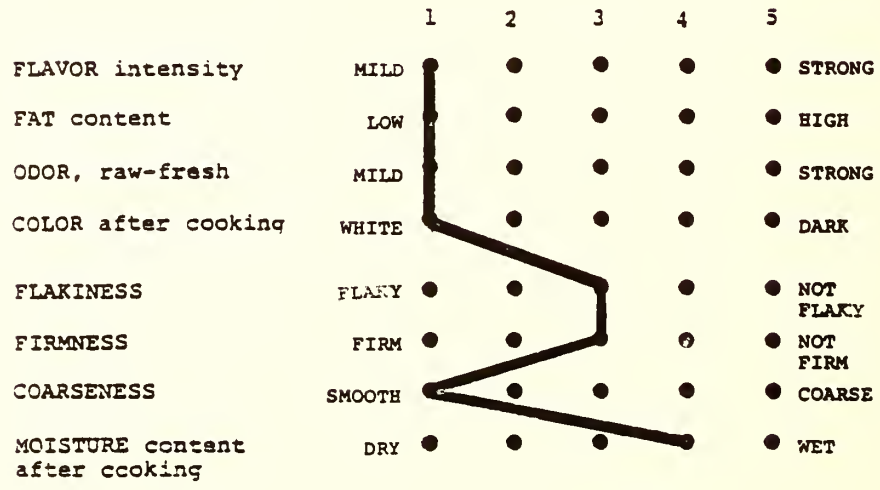
- SNOOK

Centropomus undecimalis



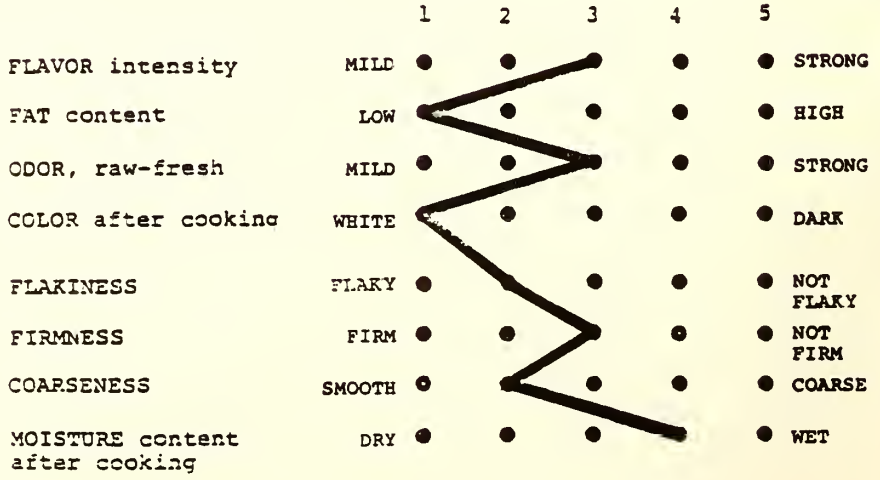
- Dover SOLE

Microstomus pacificus



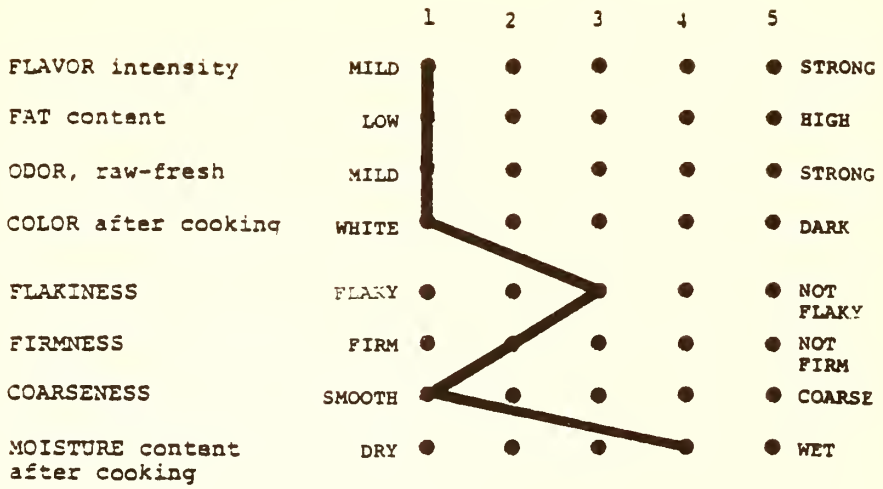
- English SOLE

Parophrys vetulus



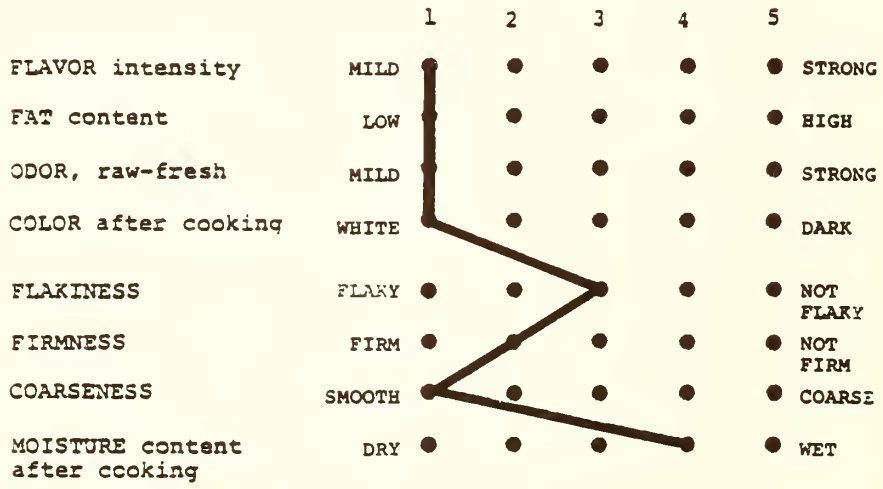
- Petrale SOLE (Brill)

  Eopsetta jordani



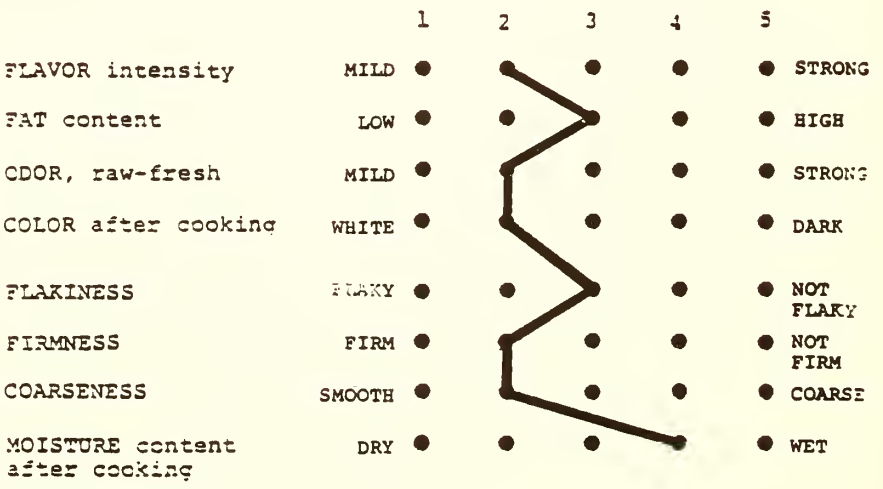
- Rex SOLE

  Glyptocephalus zachirus



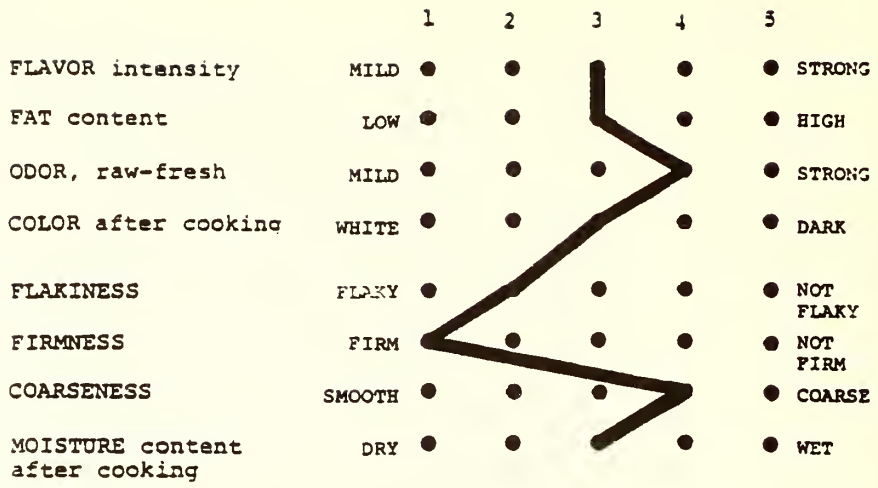
- SPOT

  Leiostomus xanthurus



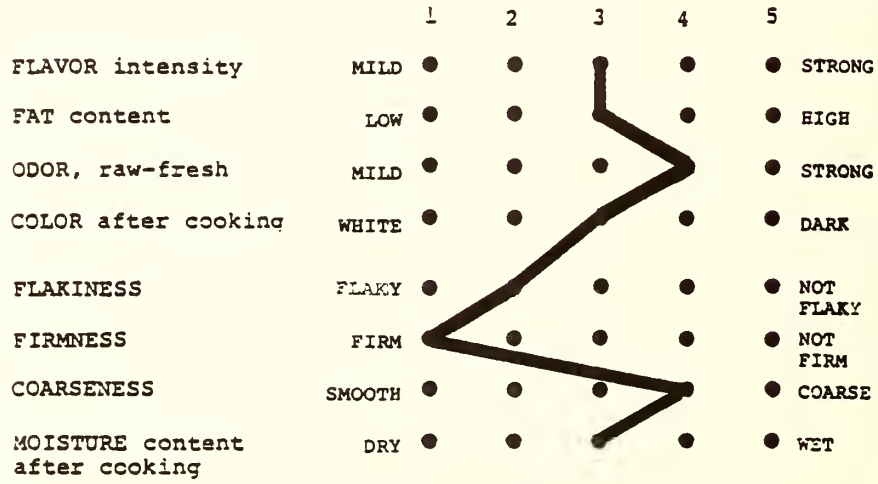
- Lake STURGEON

Acipenser fulvescens



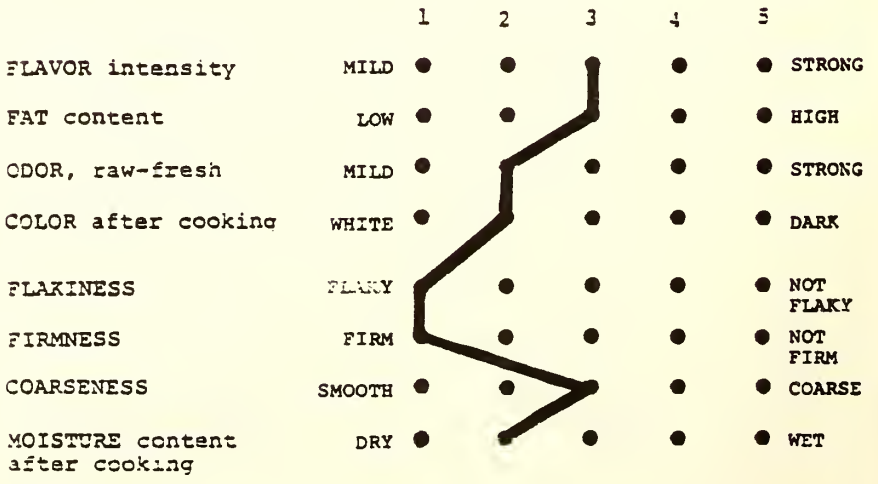
- Shovelnose STURGEON

Scaphirhynchus platorynchus



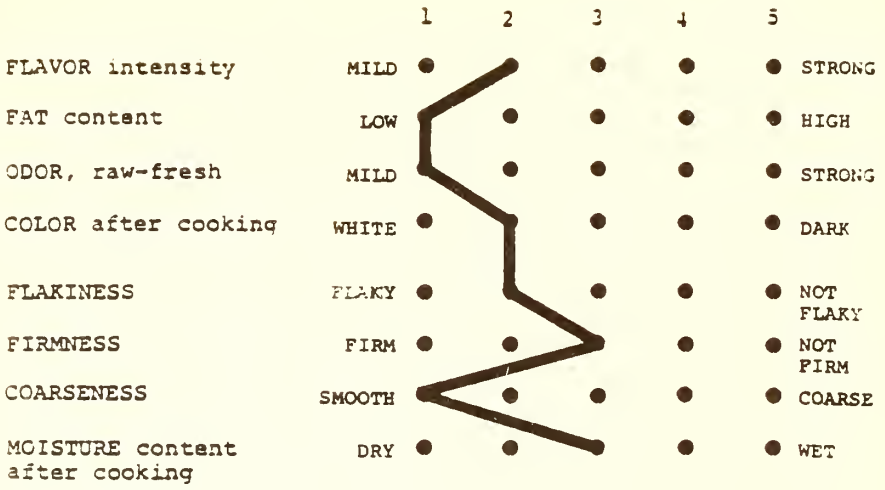
- SWORDFISH

Xiphias gladius



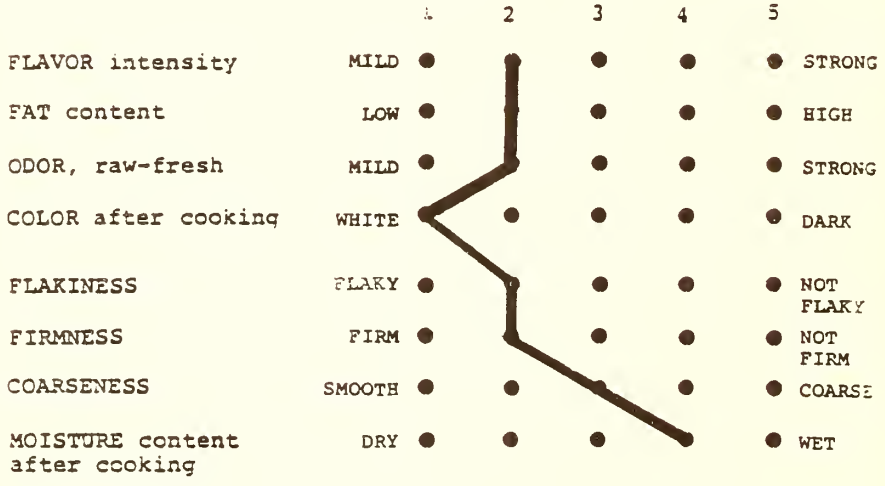
- TAUTOG
(Blackfish)

Tautoga onitis



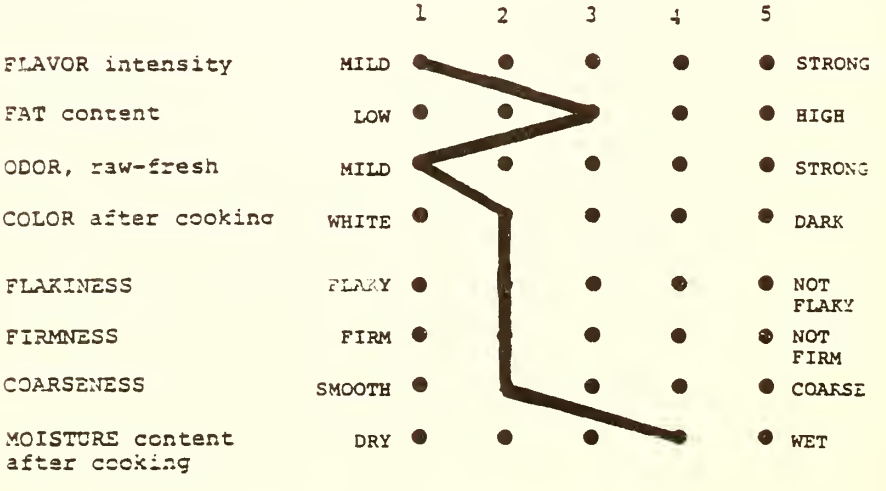
- Gray TRIGGERFISH

Balistes capriscus



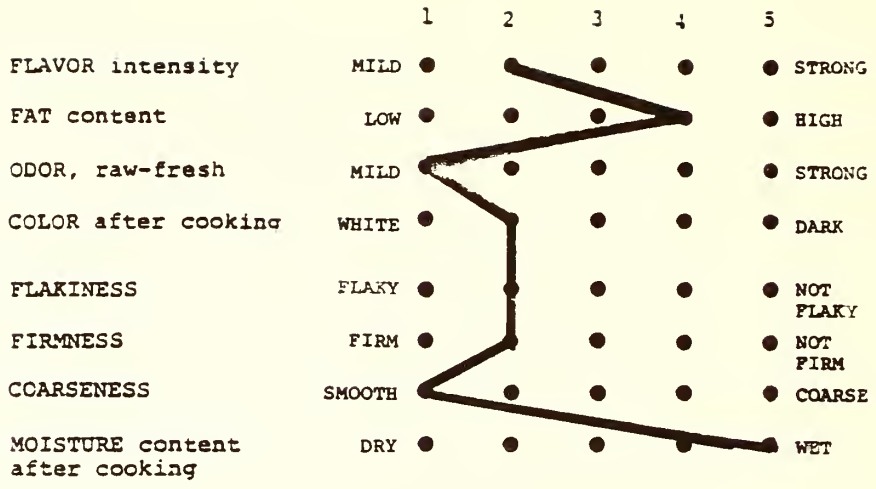
- Brook TROUT

Salvelinus fontinalis



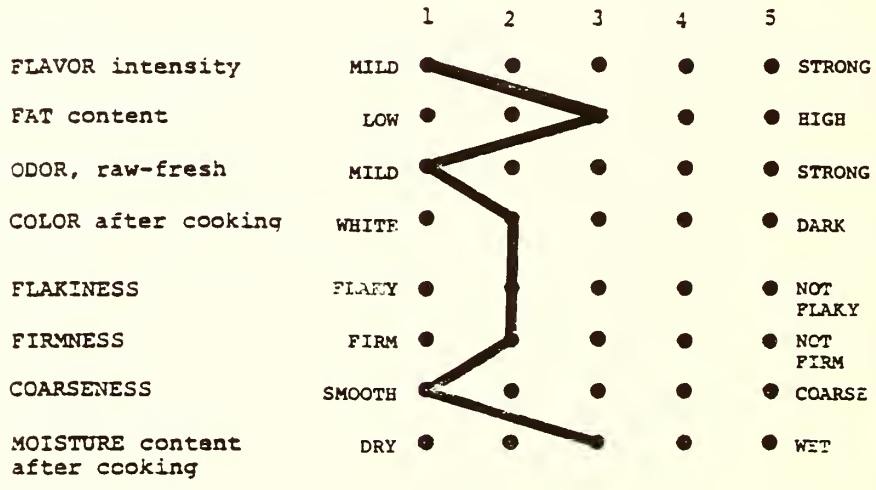
- Lake TROUT

Salvelinus namaycush



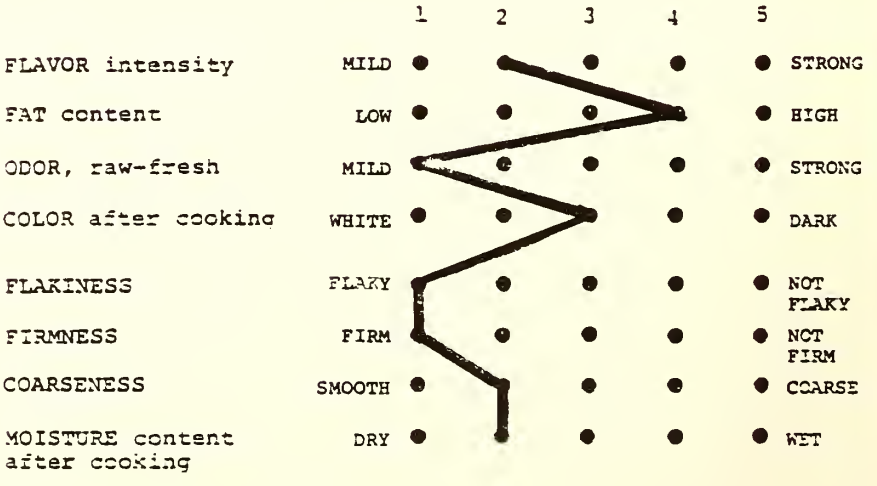
- Rainbow TROUT

Salmo gairdneri



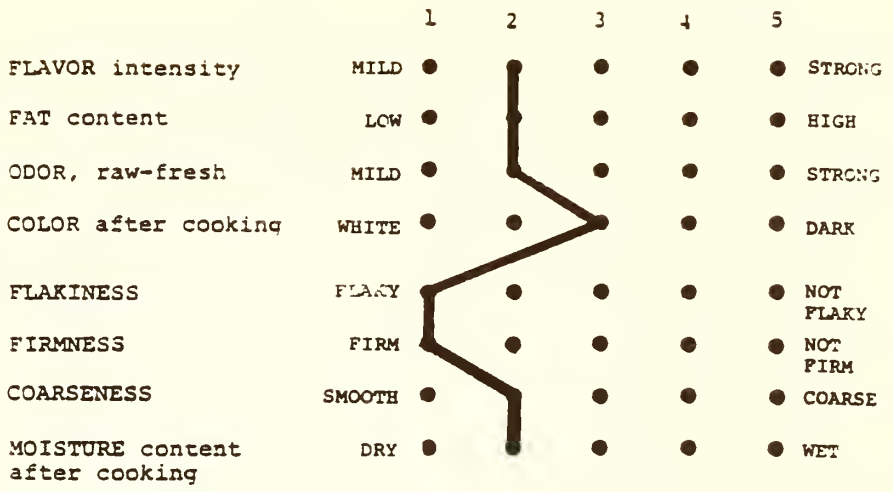
- Albacore TUNA

Thunnus alalunga



- Blackfin TUNA

  Thunnus atlanticus



- Bluefin TUNA
  (Horse Mackerel)

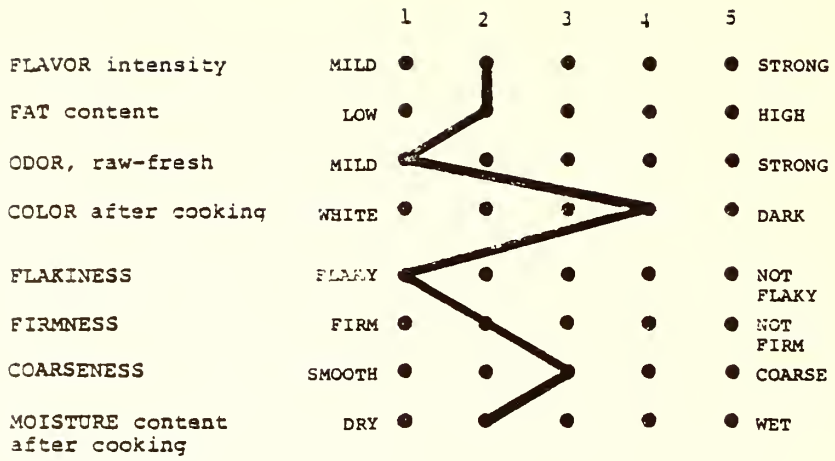
  Thunnus thynnus

- Skipjack TUNA
  (Oceanic Skipjack)

  Euthynnus (Katsuwonus) pelamis

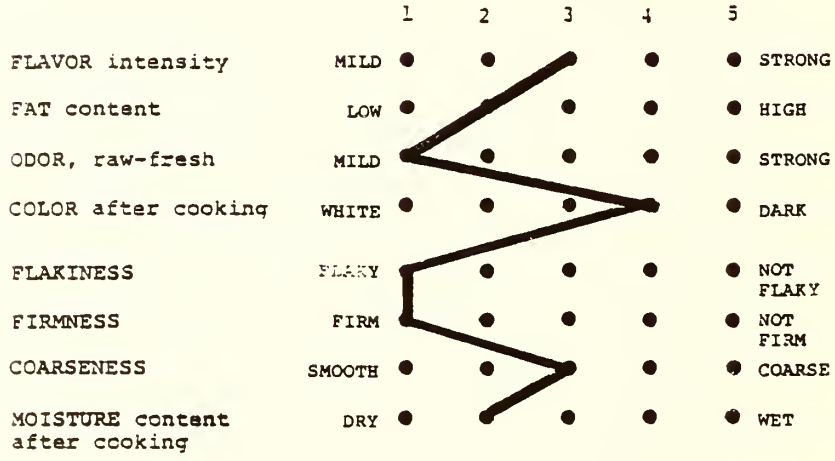
- Yellowfin TUNA

  Thunnus albacares



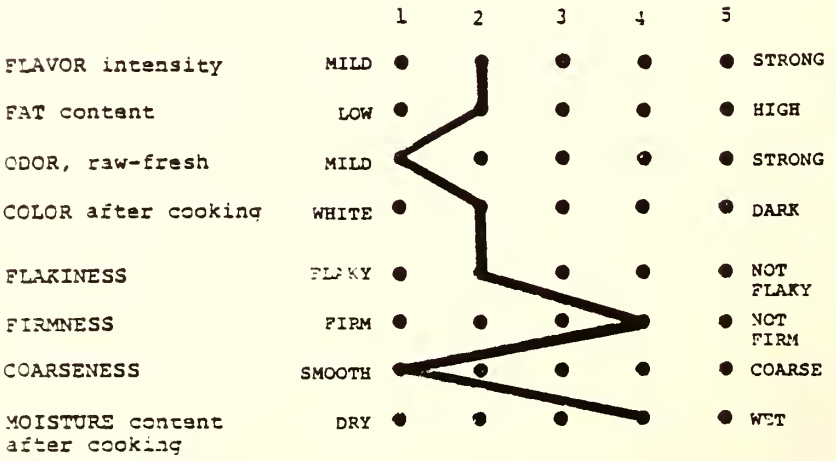
- Little TUNNY
  (False Albacore)

  Euthynnus alletteratus



- TURBOT

  Psetta (Sophthalmus) maxima



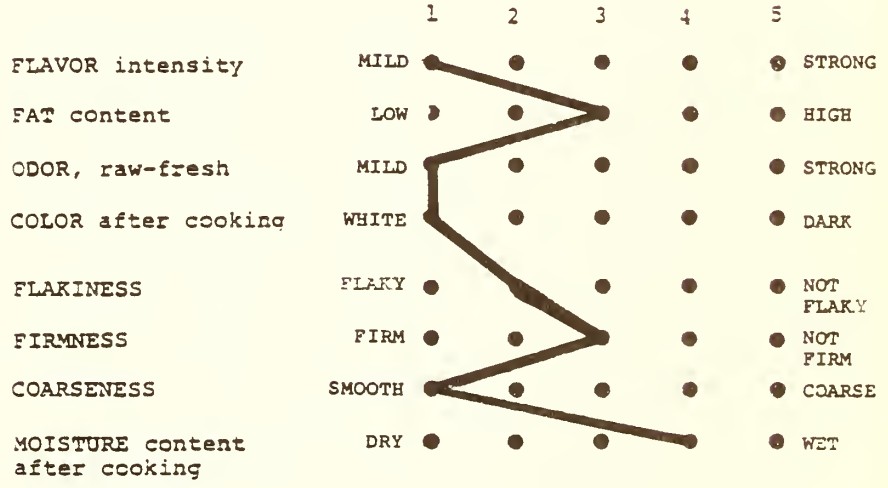
- Greenland TURBOT
  (see Greenland Halibut)

- WALLEYE

Stizostedion vitreum vitreum

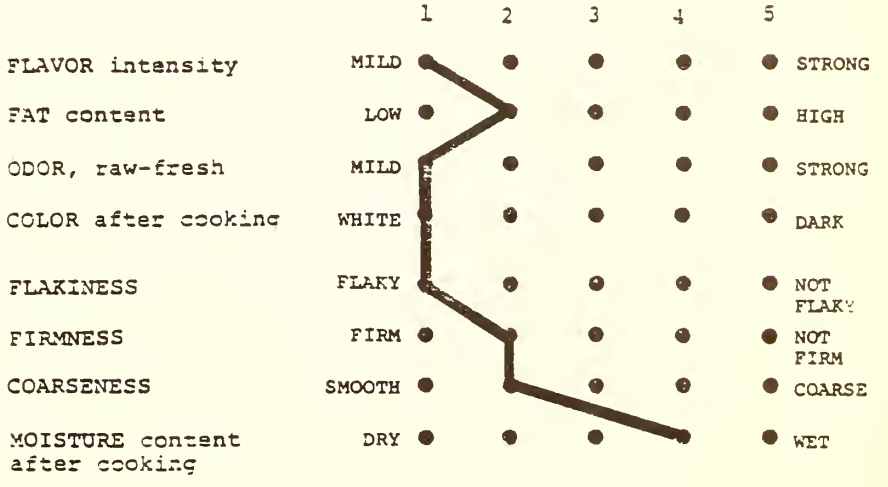
- Lake WHITEFISH (Common Whitefish)

Coregonus clupeaformis



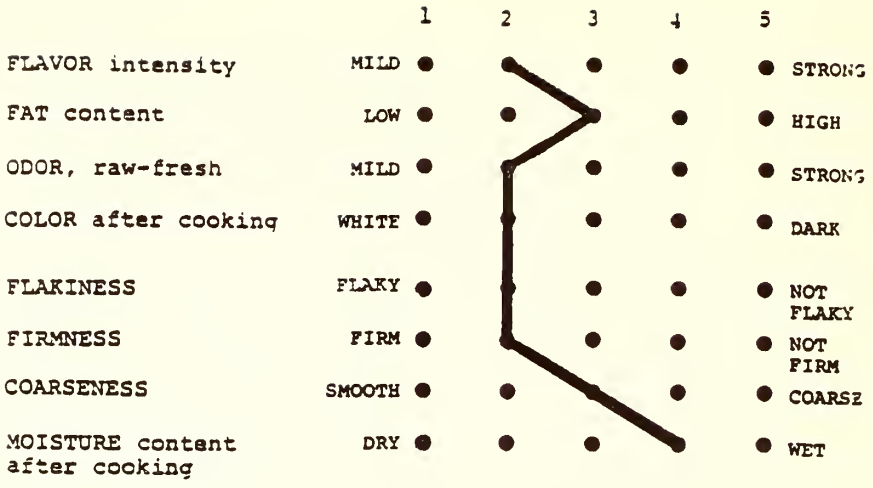
- Ocean WHITEFISH

Caulolatilus princeps



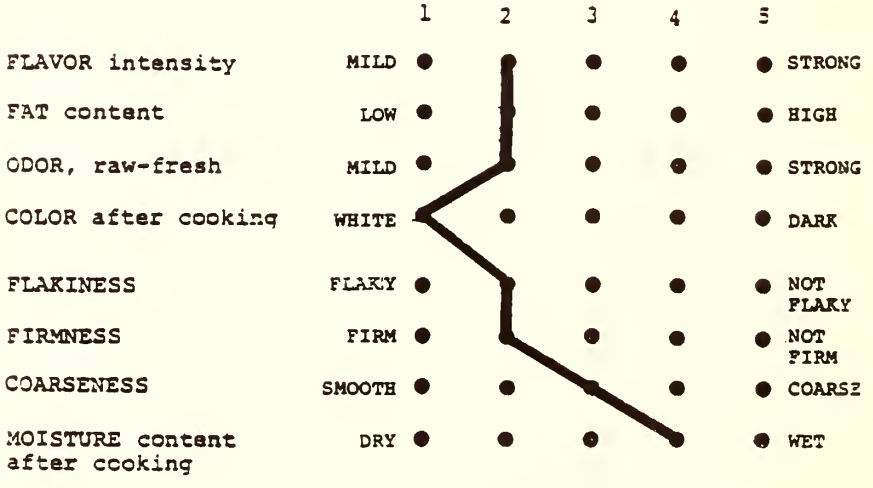
- WHITING
(Northern Kingfish)

Menticirrhus saxatilis



- Atlantic WOLFFISH

Anarhichas lupus



STEP II
ANALYSIS OF SIMILARITIES AMONG SPECIES

This second major step in the project involved comparison of the edibility profiles for the sample of finfish to determine which species have similar patterns of edible characteristics. The main purpose of these studies was to determine an objective method of organizing species of finfish into distinct groups on the basis of edibility characteristics. Due to the large volume of data, computer techniques were used in comparisons and analysis.

Seven studies, using computer analysis, were conducted in this project. Each study was a separate exploration to determine which species would be "grouped" together under different sets of conditions.

Edibility characteristics for shellfish were included in some of the early studies. This helped to confirm that although shellfish and finfish can be compared on some factors, each represents a different kind of eating experience and should be classified separately. Later studies were confined to finfish.

In early studies, various combinations of up to 40 factors were tried. In later studies, edibility profiles based on 8 factors and a 5-point rating scale were determined to be a more convenient, effective basis of comparison for the 123 species of finfish used in the model.

Different factor weighting strategies were explored in the analysis. In one set of studies, all factors were weighted equally. In others, various priorities of factors were tried. Based on these studies, the following observations were made:

1. Changes in weighting strategies affected the clarity of groupings without producing serious changes in the placement of species in groups.

2. Changes in the number of species used affected where fish were placed as relationships became available or were removed.

3. Excluding anatomical features (i.e., bones, body shape, etc.) from the early studies caused almost all correlation with zoological groupings to disappear.

4. Reduction of the number of factors from 40 to 8 produced greater clarity without radically affecting the general groupings produced by the factors.

5. A wide variety of edible profile patterns exist among species when they are compared on the basis of multiple (8) equally weighted factors. This results in a great number of small groups being formed, each of which has a different profile for the 8 factors.

6. Strong weighting of certain factors resulted in fish being sorted into groups that were similar to groups formed on the basis of equally weighted factors, but which were easier to adapt to a simple organizational framework.

In the final studies, these 8 factors were given a geometric progression of weights in the following order:

FLAVOR	8
FLAKINESS	8
FAT	4
FIRMNESS	4
ODOR	2
MOISTNESS	2
COLOR	1
COARSENESS	1

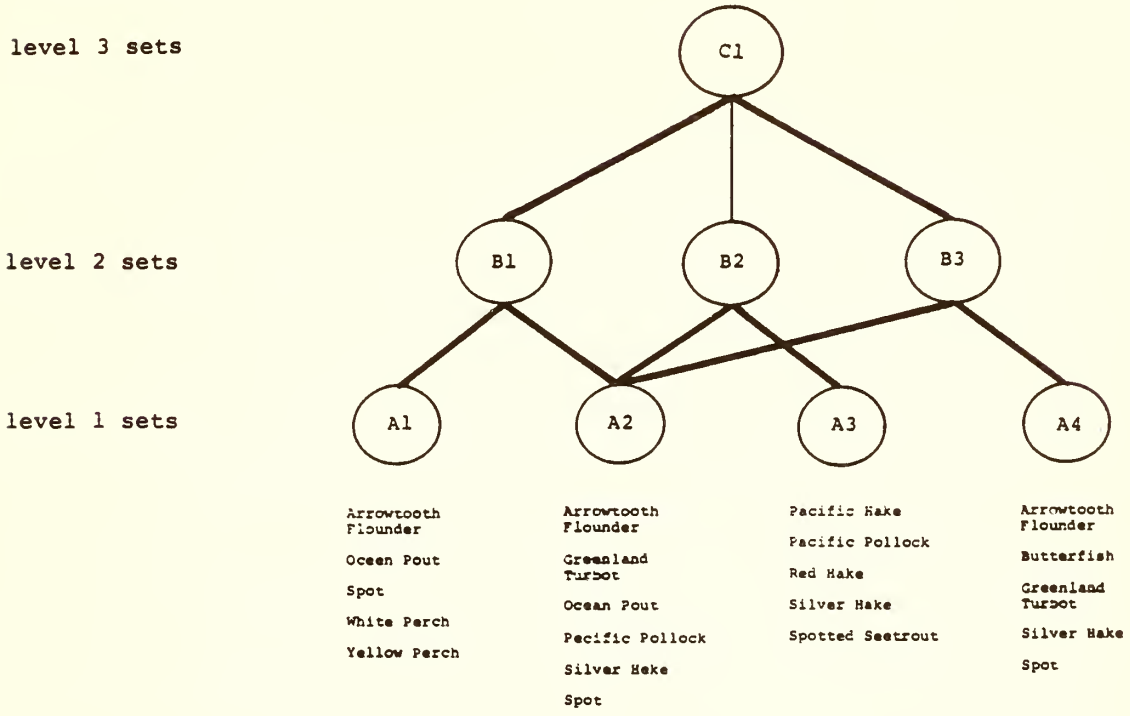
In final studies, with the assigned geometric progression of weights, sets were divided along lines established by the first two (highest weighted) factors: FLAVOR and FLAKINESS. Subgroups were determined by each subsequent pair of factors, according to the weighting assigned. For comparison, Figure B shows a portion of the groups formed by each of the following approaches: a) equally weighted factors - "composite similarities graph" and b) priority weighted factors - "factor sorting graph".

Figure B

GROUPS FORMED BY UNWEIGHTED VS WEIGHTED FACTORS

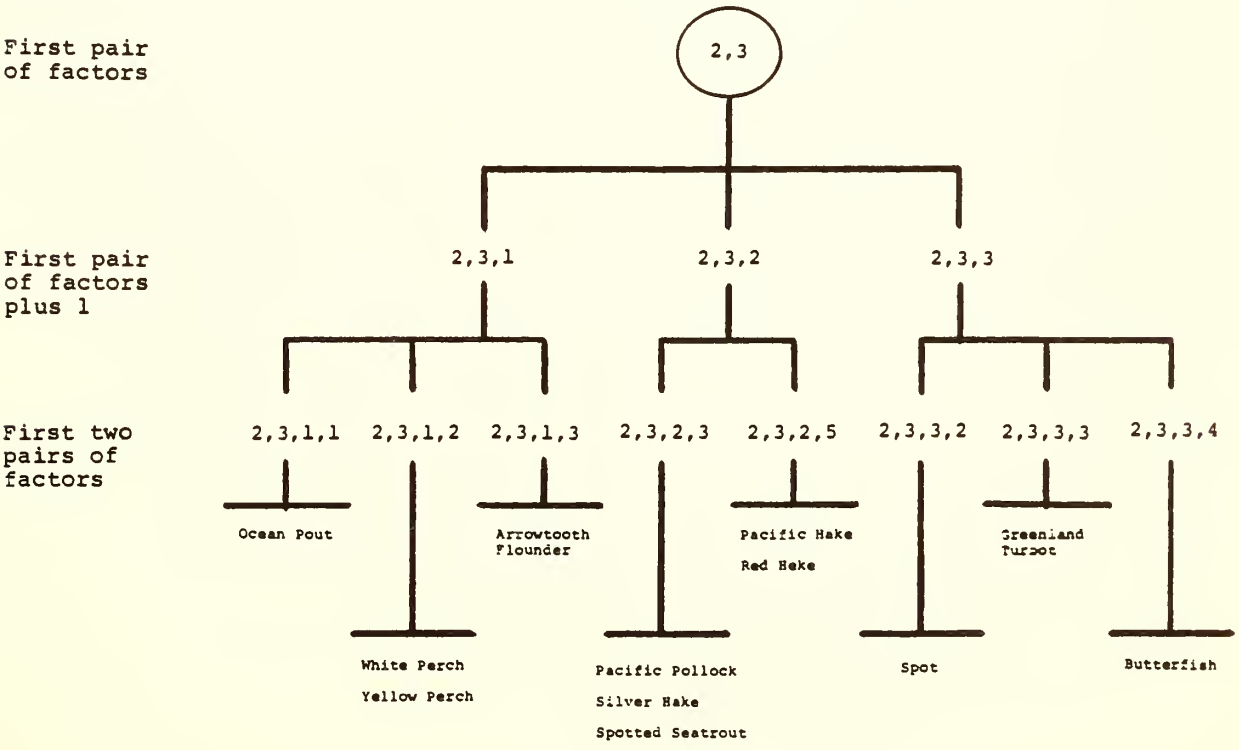
COMPOSITE SIMILARITIES GRAPH

On the basis of 8 equally weighted factors



FACTOR SORTING GRAPH

On the basis of 4 sets of prioritized factors



These studies showed that establishing factor priorities is a necessity. The factor sorting approach produced results that are far easier to communicate to consumers. In addition, by using this approach, species can be classified without the need for computer processes.

A factor sorting framework that encompasses all seafood species was developed for this model. Eight factors (4 pairs) were used, all were rated on a consistent 5-point scale. This means that nearly 400,000 (5^8) combinations of edibility profiles are available. This is obviously more than will ever be needed. At a more functional level, the first pair of factors will provide 25 groups (5^2) into which finfish can be sorted.

Weighting factors in this way provided a practical approach to organizing edibility data for use in an identification plan. A more complete description is included later in this report in the section titled An Organizational Framework for Seafood Species.

STEP III
DEVELOPMENT OF A MODEL IDENTIFICATION PLAN

The third major step in the project was to structure several alternative retail identification plans, and to evaluate them comparatively in terms of convenience and usefulness to consumers, industry and regulatory agencies.

What Is An Identification System?

A product identification system is a distinctive kind of labeling program with a unique and important function to serve. It is essentially an organized set of names by which people can identify individual products and distinguish them from others.

An identification system is based on sorting different species such as Codfish and Flounders into several groups by using chosen base criteria (characteristics). It is a different kind of program with different objectives than other sorting/labeling programs such as food grading. A grading program is more concerned with quality than with characteristics and is based on sorting varieties rather than species, (i.e., varieties of Codfish). Product identification is the most basic labeling function. Other labeling programs provide supplementary information.

Design of the identification system is made difficult by the need to confine nomenclature on the label to the minimum necessary to do an effective job. So much information already appears on food product labels that adding more contributes to labeling "overload."

A Basic Plan Has Been Outlined

The recommendations in the previous project report (Contract #4-36730) proposed that three categories of information are necessary for a comprehensive seafood identification program.

* The FISH component of the product
* The retail product FORM
* Key product MODIFIERS, such as how it has been preserved and what other foods have been added

Figure C illustrates these three primary categories and seven subcategories of nomenclature that need to be developed and standardized as a prerequisite for identifying seafood products. As proposed, appropriate nomenclature from each of these three primary categories, presented on the product label, will provide the consumer with adequate information for effective product identification.

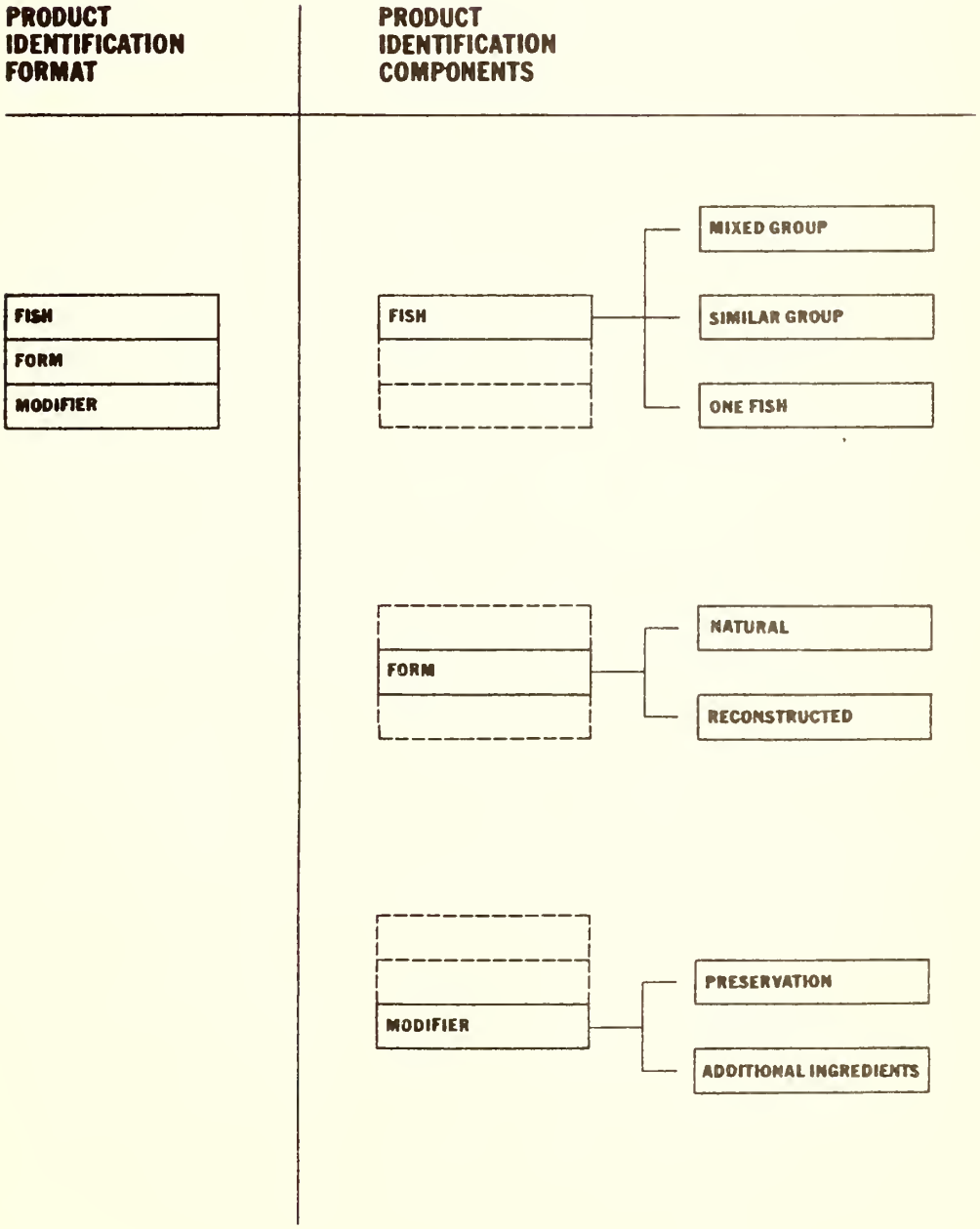
This current project is concerned with developing an identification strategy for the FISH component of the overall system. The FISH component of the system identifies the aquatic species that are in the retail product. This component has been subcategorized on three levels to include products made from multiple species as well as from a single species.

Alternatives in Designing the Species Identification System

The primary alternatives in developing identification plans involve the selection of factors, rating scales, kinds of organizational framework, and nomenclature that are most appropriate. To keep nomenclature to a minimum, only the most important factors can be used in the identification plan.

The following is a recap of how these alternatives were explored and the model identification plan was developed.

COMPREHENSIVE SEAFOOD PRODUCT IDENTIFICATION PLAN



1. The possibility of including nutritional as well as other kinds of information (i.e., anatomical, environmental, etc.) was reviewed. Edibility factors were selected on the basis of receiving the highest priority in our research. Additionally, edible characteristics vary widely from finfish species to species. They are more like the differences that exist among apples, oranges, bananas, etc. than among varieties of apples. Overall, nutritional characteristics are relatively similar for the various aquatic species which have been tested, according to the National Fisheries Institute. One difficulty in using nutritional information is that the concept of nutrition is hard to define on a product-by-product basis. The reasons are best expressed in this excerpt from "Perspectives on Federal Retail Food Grading," produced by The Office of Technology Assessment of the Congress of the United States in June, 1977:

> "Current food grades are based on criteria reflecting sensory characteristics such as flavor, texture, color, or other palatability or cosmetics factors. A major issue in food grading is whether to change this basis to reflect sensory and nutritional factors simultaneously. The issue is complex. One general problem associated with making nutritional content a basis for grades is that nutrition deals with diet. As one food grading workshop participant states:
>
> > 'We can conceive of a nutritious diet, but the concept of a nutritious food product has never been developed. There are many components of a nutritious diet, and the concept of getting them all in a product is very repulsive to nutritionists and, I think, the populous in general. So there is a very great difficulty in nutrition labeling. Any product is a component of a diet, and it may be a

useful component although it is very lopsided in its individual characteristics. What makes a nutritious product is whatever product it is combined with in a day or in a period of several days. We have a conception of nutritional diets; we do not have a conception of nutritional products.'"

2. An evaluation was made of the edible characteristics of both finfish and shellfish within existing zoological groups (which are based on comparison of anatomical rather than edible factors). This was done to determine if any direct correlation exists between anatomical and edible characteristics. We determined that a new organization was necessary for finfish but not for shellfish for the following reasons:

    A. The edible characteristics among species within zoological groups of shellfish may differ, but, the differences are not as pronounced as they are within many zoological groups of finfish.

    B. Anatomical differences among zoological groups of shellfish are greater and more significant to consumers than among zoological groups of finfish. For instance, the differences between lobsters and squid in terms of preparing, serving and eating are greater than differences among most finfish.

    C. Many more finfish are in the marketplace. Differences among shellfish are more manageable to consumers because there are relatively fewer species available. There are so many finfish that differences are far less obvious.

3. Next, each of the edibility factors was systematically evaluated individually and in combination with other factors, using computer techniques, to determine what groups of finfish would be formed. Following that, the same systematic techniques were used to evaluate various rating scales to determine the optimum number of points of discrimination.

   The selection factors and rating scales determine, to a large degree, how the identification system will operate and what information it will communicate. These selections have to be made before the identification plan can be developed.

4. The next step was to evaluate alternative methods for organizing groups of finfish. The organization is influenced by the number of factors and rating points to be established. The organizational framework selected for this model is based on a pair (2) of factors and a 5-point rating scale which is used consistently for all factors. It is derived from the factor sorting process described in the previous section, Analysis of Similarities.

5. The final step in compiling the model was evaluating alternative strategies for naming. The following alternatives were explored:

   a) Using existing nomenclature (common names)

   b) Modifying and reapplying existing nomenclature to make it more consistent and effective

   c) Creating an entirely new nomenclature system.

The nomenclature system is always developed last and is designed to fit the identification framework. This is the only way to make names work effectively and is vastly preferable to attempting to force existing nomenclature into a system for which it was not intended.

After exploring various approaches to nomenclature, a new strategy and a comprehensive new set of names was developed for this model. Certain components of existing nomenclature, particularly the common names of familiar species of finfish and shellfish, have wide use and acceptability in the United States. This was taken into consideration in compiling recommendations on how to develop and use the model identification system.

6. At the conclusion of these steps, a description of the model identification plan was compiled into a report. The plan and recommendations was then discussed with an ad hoc review board. The following section summarizes the responses of the review board.

STEP IV
REVIEW OF THE MODEL IDENTIFICATION SYSTEM

When the model plan had been developed, an ad hoc review board was convened to review and to discuss it. This panel consisted of individuals qualified to represent federal regulatory agencies, the seafood industry in both the private and government sectors, consumers, key segments of the food industry, and other concerned or interested viewpoints. The primary objective in conducting the review board was to scrutinize the plan from each of these pertinent perspectives and to stimulate response or reactions.

The following individuals participated in the review board discussion:

Ellen Broadman	Consumers Union of the U.S., Inc.
James Brooker	National Marine Fisheries Service
Willard Doyle	Brand Group, Inc.
Meredith Fernstrom	Department of Consumer Affairs Division U.S. Department of Commerce
Ken Johnson	National Livestock and Meat Board
Roy Martin	National Fisheries Institute, Inc.
John Nichols, Ph.D.	Texas A & M University - Department of Agricultural Economics
Robert Nordstrom	National Marine Fisheries Service
Neil Rabin	Office of Consumer Affairs Department of Health, Education and Welfare
John Schnably	Office of Compliance, Food and Drug Administration
Richard Spears, Ph.D.	Department of Linguistics Northwestern University
Don Whitaker	Economist National Marine Fisheries Service

All participants were given copies of the model identification plan prior to the meeting to allow them time to review the plan and become familiar with its purposes and ramifications.

The meeting was structured as a moderated focus group discussion. It was designed to provide an informal but in-depth contribution by each participant, relative to a variety of recommendations including:

* There should be a nationwide identification program to include all seafood species and products

* A new organization of finfish should be developed on the basis of "comparative edibility"

* Major categories of seafood products should be distinguished on the basis of containing: single, similar, or mixed species

* A special interpretation of federal labeling laws should be made to account for the unique complexity of the seafood product mix

* A new, comprehensive naming system should be developed for seafood species and products, linking names to edibility characteristics

The meeting was conducted during February 1978 in Washington, D.C. In the discussions, the following values and concerns were identified by members of the review board:

1. A systematic identification program organizing seafood species into consistent groupings based on edibility was regarded as valuable in informing consumers.

This may also make it possible to aid in gaining acceptance for currently underused/unfamiliar species.

2. Various categories of "labeling" such as product identification, nutritional, ingredients, etc. are important because they help educate consumers about the product as long as an information "overload" on the package is avoided. Too much or unnecessary information on the label can create confusion and ambiguity. And, mislabeling can result in legal actions.

3. Use of the plan may affect the pricing and marketing of various species. There was a concern that in the grouping of species, inferior species might be sold at the same price or under the same name as better quality species in the same group. In response, it was pointed out that while pricing of certain species may be affected somewhat, the edibility profiles and the nomenclature plan could be applied in a way that would specifically prevent inferior species from being substituted for superior species.

4. The cost of developing and managing the program should be weighed against the savings generated by increased supplies and more effective marketing. In response, it was pointed out that the retail meat identification program which has been put into use by the meat industry, incurred initial costs but resulted in lower operating costs overall for the industry and no increase in product costs.

5. Agreement should be made on a system of nomenclature that satisfies consumer needs and accurately reflects the products. These names should be descriptive.

In general, the reaction of the review board to the plan was positive. Participants felt that an effective identification program is essential. There was interest in the concepts. Discussion involved concern that certain details might be worked out in a way that did not best serve the interests of consumers. The review board recommended proceeding to further develop and evaluate the program.

All individuals expressed interest in remaining involved personally or in having their respective organizations take a role in development or in monitoring development of the identification program.

DESCRIPTION OF THE MODEL IDENTIFICATION PLAN

Background and Need

Currently within the United States there are more than 500 edible species of finfish and shellfish marketed. Worldwide there are more than 1,000 edible species. Hundreds more are accessible and could be brought into the commercial market.

The number of retail products derived from these species is enormous. It is extremely difficult for a consumer to compare them intelligently without the assistance of an effective identification plan.

In terms of annual sales, the seafood industry is only a fraction of the size of the meat industry in the United States. In terms of number and variety of products, however, the seafood industry is second to none in the world.

It is the oldest of American industries but is still characterized by a large number of relatively small, independent producers (fishermen), processors, wholesalers and a variety of associations and organizations at local and regional levels. To a large extent, species are also regional.

In recent years, the seafood industry has been faced with diminishing stocks of traditionally popular species such as Haddock and Cod. The industry has attempted to expand markets for less familiar species, but has found it difficult since American consumers tend to be reluctant to try unfamiliar species of fish and shellfish.

Efforts to develop markets for unfamiliar species have met with only limited success in individual cases. These efforts can be tremendously costly in terms of dollars required to educate the American consumer about each new species individually. Lacking the resources for effective national marketing programs, most processors look for other ways to gain acceptance for unfamiliar, underused species.

Many objectives can be achieved by simply clarifying for consumers the range and scope of seafood products that are available, and by making it easier to shop for them intelligently. An effective identification system can contribute substantially to accomplishing this. The seafood industry needs an effective retail identification system; one that will help consumers learn about and understand seafood species and products. A model of such a system has been compiled during this project. The following two sections describe the fundamental components of the model.

Components of the Model Identification System

This model is to demonstrate how a well conceived identification system can make intelligent shopping easier for consumers by providing useful information in a simple, easy to understand format. It is comprised of two primary components:

1. An organizational framework--a system for categorizing seafood species and products.

2. A nomenclature system--a comprehensive set of names that are used to identify each of the species and products.

The following two sections describe the model identification system developed in this project in terms of these components.

AN ORGANIZATIONAL FRAMEWORK FOR SEAFOOD SPECIES IDENTIFICATION

The Need to Simplify

For the most part, consumers are not aware of the tremendous variety of seafood species and products in the marketplace. Without a consistent product identification system, the seafood product mix will continue to defy comprehension and will make intelligent shopping for seafood products extremely difficult.

To clarify the picture for consumers, it is necessary to develop a comprehensive product identification system based on a totally new organization of seafood species and products, one that can be more easily understood. A totally new organization is necessary to reduce the number of things the shopper has to deal with to a more manageable level, and to clarify what can be found in the marketplace. General requirements for the organizational framework are that it:

* Encompass all species and products of the seafood industry including fresh water and salt water species and products made from finfish and shellfish

* Satisfy the needs and desires of consumers and the seafood industry for useful information

* Be simple to understand and use in order to ease the tasks of labeling and shopping

* Be objective and impervious to manipulation by any special interests so that it serves the public and the industry as a whole

Seafood Product Identification Framework

If a complete inventory of seafood products were made, it would reveal hundreds of thousands of different products. The purpose of an identification system is to enable consumers to shop among these products and to distinguish an individual product from all others. To do this, three kinds of information are necessary:

* The kind of FISH (finfish or shellfish) in the product

* The FORM of the product (e.g., steaks, fillets, chunks, etc.)

* Significant product MODIFIERS; especially, how it is preserved and additional food ingredients

Finfish and shellfish are the main ingredients of seafood products. This model is based on the characteristic similarities and differences among various species of finfish and shellfish.

A broad analysis of the species, processing and products of the seafood industry indicates that three major categories of products exist:

> INDIVIDUAL SPECIES PRODUCTS (ISP)--these are products which are derived from one distinct species of finfish or shellfish.
>
> SIMILAR SPECIES PRODUCTS (SSP)--these are products made from several species, all of which are essentially similar in terms of their edible characteristics.
>
> MIXED SPECIES PRODUCTS (MSP)--these are products which are made from a combination of finfish and/or shellfish that are dissimilar in character.

INDIVIDUAL SPECIES PRODUCTS--these products are more familiar to consumers. They are based on a single species of finfish or shellfish. The characteristics of one species in comparison with another are important. Relatively few new species enter the marketplace each year compared to the number of products that are added. But, with 500 to 1,000 species already available, the possibility of exposure to new species is substantial, especially for American consumers who are typically familiar with only a few species.

SIMILAR SPECIES PRODUCTS--many products are made from "interchangeable" species, that is, from species whose edible characteristics (such as flavor, fat content and texture) are similar. Characteristics of the species remain stable even though several different species may be in the product. For these products, knowing which kind of fish is in the product is more important than knowing the identity of the individual finfish or shellfish. There is a substantial potential for growth in this product category for the same reasons as for mixed species products.

MIXED SPECIES PRODUCTS--the characteristics of these products depends on the mix of species, not on the character of any single species or kind of species. At present, the number of products in this category is not large relative to the total number of seafood products. The potential for future growth, based on the infinite number of ways species can be combined to create new products, is enormous. In addition, mixing species can offer economic advantages which can be passed along to the consumer.

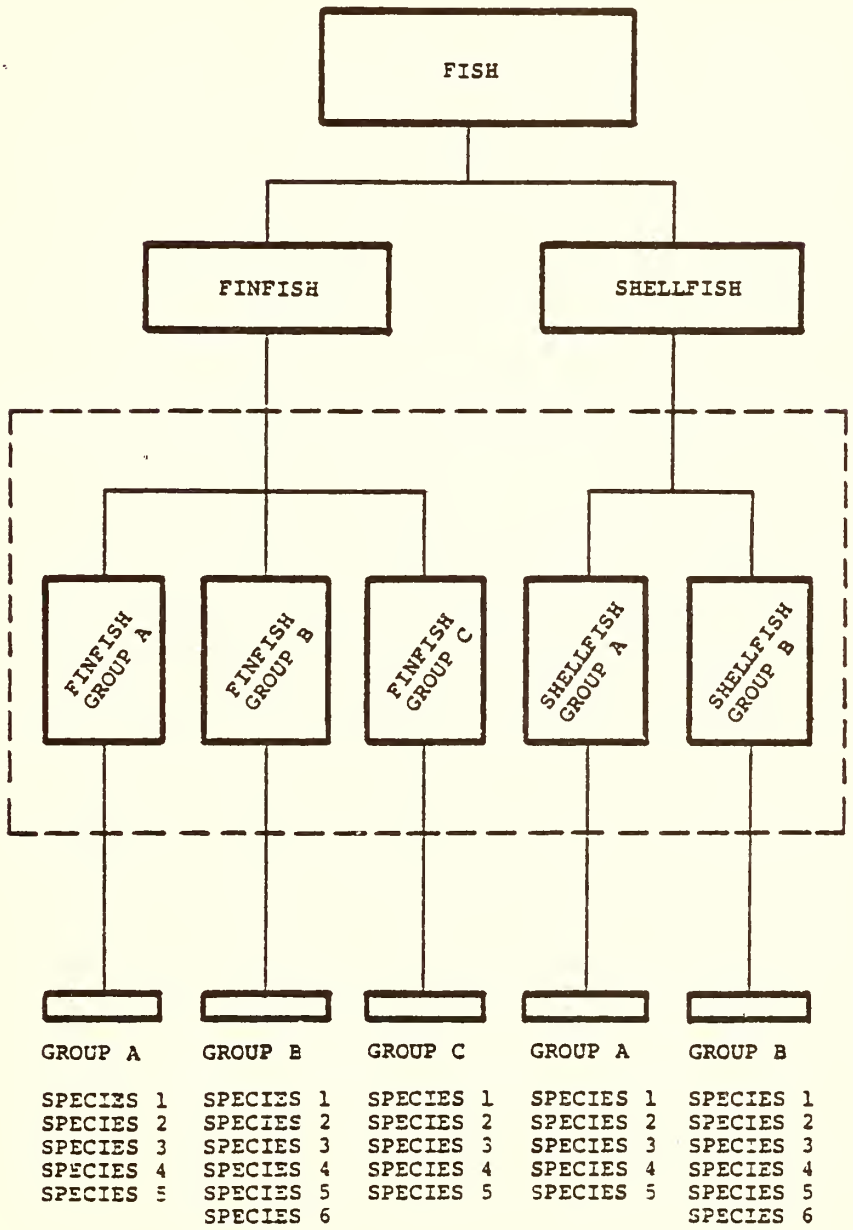
Figure 1 illustrates an organizational framework that encompasses all three product categories. This is the basic framework developed for this product identification model. Three product categories have been established because they represent major distinctions in terms of edibility and economics.

Edible differences among species tend to average out and become less important when going from the ISP to the MSP level. Differences among individual species are most important at the ISP level, and relatively unimportant at the MSP level. Mixing species of different market values will tend to average out their economic differences as well. Three separate species may command low, moderate and high market price, respectively, at the ISP level. They would typically produce a moderately priced combination at the MSP level.

Based on this framework, shoppers will be able to determine the appropriate category for any seafood product. This is the first piece of vital information that will be provided on the product label.

Figure 1

SEAFOOD SPECIES IDENTIFICATION FRAMEWORK



MSP
Mixed Species Products

SSP
Similar Species Products

ISP
Individual Species Products

Identification Framework for Similar Species Products

The key to the entire framework is at the SSP level where individual species are organized into groups of "similar species." The purpose of this level is to make it easier for consumers to relate to the 500 to 1,000 currently marketed commercial species (and those which may become commercially important in the future). This is done by sorting all species into a manageable number of groups of similar species so that shoppers can deal with a few categories of finfish and shellfish rather than with each individual species one at a time. The factors on which "similarities" are established are of utmost importance. There are diffences between the organizations that will work effectively for finfish and shellfish.

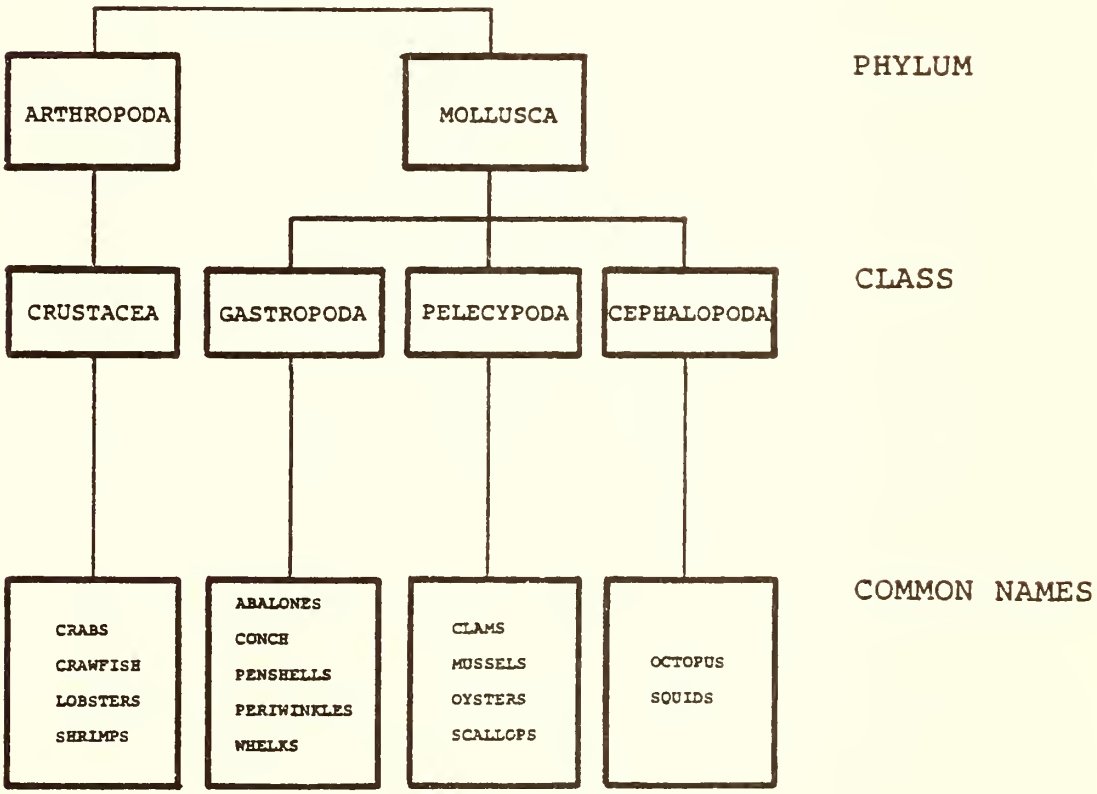
Zoological Organization for Shellfish

Scientists use a method called Systematic Zoologyfor organizing animal life forms. It is based largely on comparing anatomical structures. These zoological classifications can be useful for identifying shellfish products as long as certain conventions are established for product labeling.

Figure 2 illustrates a simplified zoological organization for common species of shellfish. Anatomical characteristics in shellfish relate directly to methods of preparation and to edible characteristics of the various species. As a result, a simplified version of

Figure 2

ZOOLOGICAL ORGANIZATION FOR SHELLFISH



the zoological framework is useful for product identification. The relatively small number of shellfish species that are marketed are already classified into a convenient number of groups. At the SSP level, shellfish product identification can be effectively related to these zoological groups. Species within zoological groups of shellfish are relatively similar in terms of the kind of meat they provide, and are relatively different from species in other zoological groups. In addition, the number of shellfish in the marketplace is not beyond comprehension. This is not so, however, for finfish.

There are at least ten times as many finfish in the marketplace as shellfish. This minimizes the value of comparing anatomical features. More importantly, zoological categories of finfish frequently include species of finfish that have widely differing edible characteristics. As far as the shopper is concerned, all the species of finfish from a zoological group are not similar. For this model, the question of choosing a basis for determining which finfish are similar was resolved by seafood consumer and industry research.

Finfish Identification Based on Edibility Factors

Our research indicates that of all the characteristics of finfish that might be considered, the characteristics of the edible portion (e.g., the meat) are the most important. Seafood consumers and the seafood industry appear to be in complete agreement on this point. Consumers are sensitive in perceiving differences in the edible characteristics of the meat but individually are familiar with only a few of the many species that are available.

Organizing groups of finfish on the basis of their edible characteristics will enable consumers to become familiar with a great many more species. "Comparative Anatomy" is the primary basis used by scientists to establish zoologically similar groups. The term "Comparative Edibility" was coined to describe this consumer-oriented basis for establishing groups of similar finfish.

Edibility Factors

Experts may use more than 40 different factors in describing the organoleptic properties of wine. In the same way, a large number of factors can be used to describe the discernable differences in edibility among finfish. In both cases, fewer factors are actually necessary for effective identification. Research among seafood specialists and consumers indicates that the following are among the most important:

* Intensity of the FLAVOR
* FLAKINESS of the meat (after cooking)
* FAT content
* FIRMNESS of the meat (after cooking)

* Natural ODOR of the meat (when raw and fresh)

* COARSENESS of the meat

* COLOR of the meat (after cooking)

* MOISTURE of the meat (after cooking)

FLAVOR--Some fish are very mild tasting. Others are, by nature, more robust. It is a matter of individual taste whether strong or mild flavor is preferred. It is wrong to assume that strong flavor in fish means poor quality.

FLAKINESS--It is a characteristic of certain species that the meat flakes readily when cooked, and of other species that the meat shows little or no flakiness. Stringiness and other textural characteristics may occur but flakiness appears to be the most important consideration. Flakiness, like flavor, is a matter of preference, not quality.

FAT--All fish have some fat content. Fish are often recommended for people on low-fat diets since the fat is lower in cholesterol than the fat of land animals. Fish that are high in fat are usually prepared differently from fish that have a low-fat content. In certain species, the

kind of fat is important. Usually, the relative amount of fat is of most importance. Once again, fat content is a matter of preference.

FIRMNESS--When cooked the same way, the meat from various species of fish can range from very firm, almost resilient, to very soft or mushy.

ODOR--Fresh fish has a mild, sweet odor like fresh meat. A strong odor means that the fish is not fresh. The tendency of a fish to give off a characteristic odor is closely related to the kind and amount of fat present in the meat. In a few species, the fat oxidizes so rapidly once the fish is removed from water, that the fish is almost never encountered without a noticeable odor.

COARSENESS--Certain species have a noticeable granular character in the meat, while others are smooth, almost creamy.

COLOR--The color of the fish is an aesthetic consideration. The American taste seems to prefer delicately flavored, light or white-fleshed fish. But, there are excellent species of fish that have very dark meat.

MOISTURE--Certain fish are characterized by flesh that remains moderately moist when it is properly cooked. Some fish tend to dry out more rapidly while others tend to remain more moist when cooked.

Method of Rating Edibility Factors

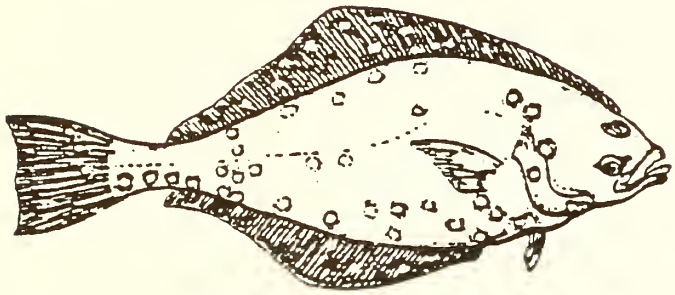
Shoppers are concerned with "discernable differences"--those that can be readily noticed. For this model, we developed a 5-point rating scale for use with each of the edible factors. Five points were chosen as a reasonable range of perception, for the same reason most people order their steaks either RARE, MEDIUM RARE, MEDIUM, MEDIUM WELL, or WELL DONE. Another example is cheddar cheese which is labeled MILD, MEDIUM, MEDIUM SHARP, SHARP and EXTRA SHARP. For the majority of consumers, 5 points of distinction seems about right. Further analysis beyond this program may reveal that fewer or more points of distinction are appropriate for certain factors.

Each end of the rating scale (1 or 5) represents the extreme measure found for that characteristic. For example, in measuring intensity of the FLAVOR, a fish with the rating of 1 is the mildest, and a fish with the rating of 5 has the strongest flavor.

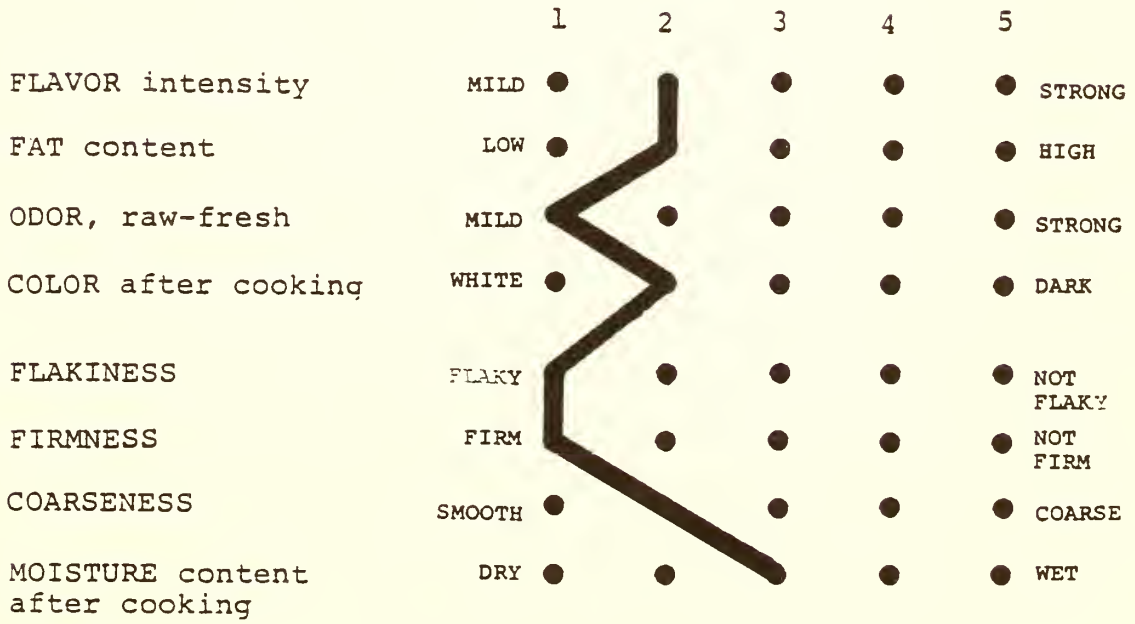
For this model program, we used a sample of 123 species of finfish. These were intended to represent a cross section of edible characteristics, and to include the extreme ratings for each of the 8 factors.

Research among seafood industry specialists provided empirical data on the edible characteristics of the sample of species. Each fish was given a rating for each of 8 factors of edibility. With this data, an edibility profile was compiled for each of the species. Figure 3 illustrates how the edibility profile can be represented graphically. For greater clarity, the 8 factors were organized into two sets of 4 closely related factors: FLAVOR, FAT, ODOR, and COLOR are closely linked to one another; and FLAKINESS, FIRMNESS, COARSENESS, and MOISTURE all describe the textural properties of the meat.

EDIBILITY PROFILE FOR FINFISH



ATLANTIC HALIBUT
Hippoglossus hippoglossus



Edibility profiles provide a consistent basis for comparing the edible characteristics of the sample species. In addition, they provide a great deal of useful information to consumers. Knowing the edible profile for a fish can reduce the fear of trying new, unfamiliar seafood species and products. This is information that is not currently available to the shopper for such a broad selection of edible species. An objective of further development efforts beyond this project will be to compile edibility profiles for all commercially available species of finfish.

Identification Framework for Finfish

Edibility factors are used for sorting finfish into groups of similar species. The number of factors and the number of rating points determine how expansive an organizational framework will be. To develop an identification system that includes all 8 factors and 5 point rating scale, would require an array of almost 400,000 separate groups (5^8). A more practical approach is to select a pair of key factors as the primary basis for determining groups of similar species. Two factors are useful for the following reasons:

* For market identification, between 20 and 30 groups can be accommodated with relative ease. A pair of factors based on 5 rating points for each will provide a framework with 25 groups (5^2).

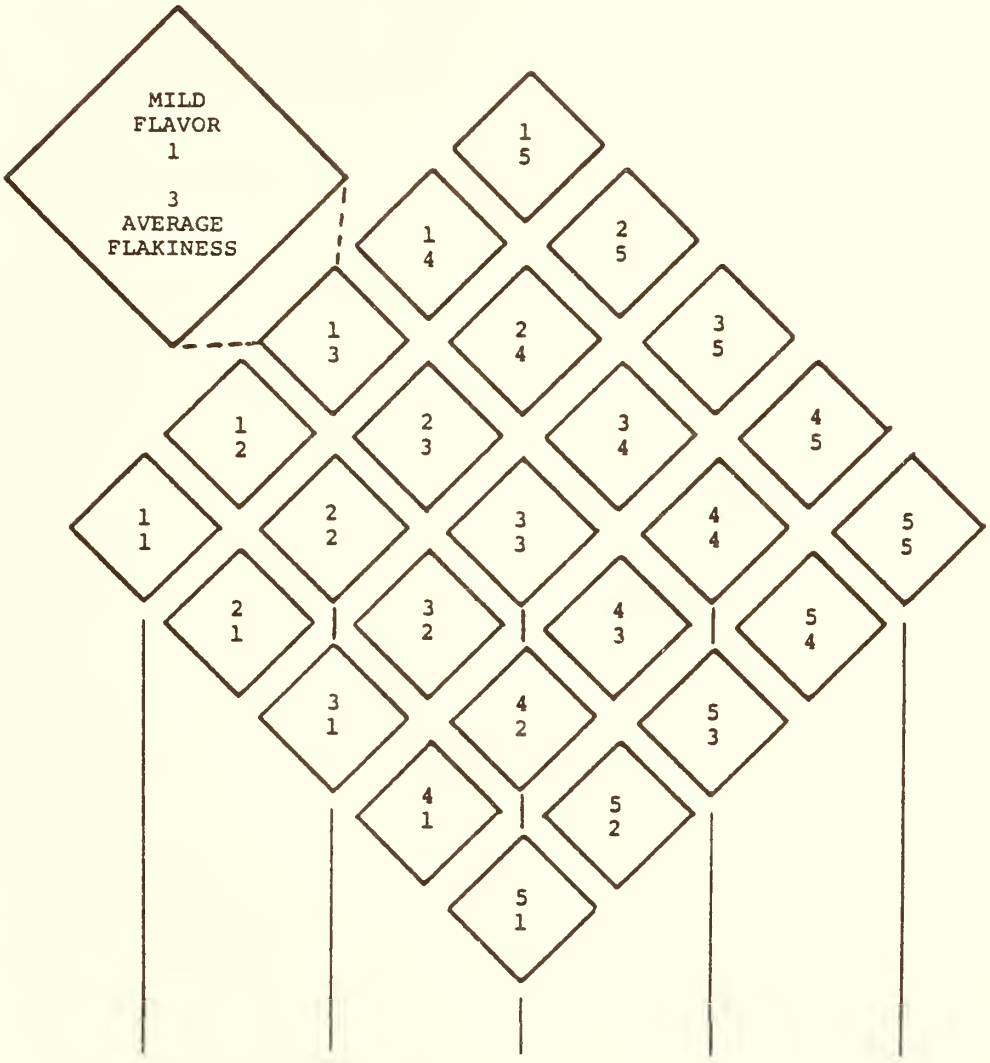
* Two factors are adequate at the SSP level for product identification. Many labeling programs are based on only a single factor, for example: red meat grading standards were, until recently, primarily based on comparison of marbling; grading standards for olives are based primarily on distinctions of size; the retail identification program for red meat is based on location of the cut of the meat in the carcass of the animal, and so on.

* Two factors can be easily represented simple, visual diagrams. This is extremely important in communicating with consumers through pamphlets, handbooks, and posters which will help explain the product identification system.

The actual selection of the pair of factors is important, and will be discussed shortly. Development of an organizational framework for the SSP level can be accomplished independently of factor selection. Figure 4 describes the organizational framework developed for similar groups of finfish at the SSP level. It is based on "Comparative Edibility." Each block represents a category of finfish that are similar for two key factors. The numbers in each block represent the respective ratings for the pair of factors.

Figure 4

ORGANIZATIONAL FRAMEWORK FOR FINFISH



1	2	3	4	5	
MILD FLAVOR	MODERATELY MILD FLAVOR	AVERAGE FLAVOR	MODERATELY STRONG FLAVOR	STRONG FLAVOR	FACTOR A
1	2	3	4	5	
FLAKY	MODERATELY FLAKY	AVERAGE FLAKINESS	SLIGHTLY FLAKY	NOT FLAKY	FACTOR B

All finfish species that have identical ratings for the pair of factors will be located in the same block. One block is provided for each combination, whether or not there are any commercially marketed fish that have that combination of characteristics. Thus, a place is maintained for the future classification of any species which is not now marketed.

Using this framework, all fish species can be classified into the 25 primary groups by the following method:

1. Two edibility factors are chosen as the basis for comparison.

2. For each fish, a standard rating is determined on a scale from 1 to 5 for each of the two factors.

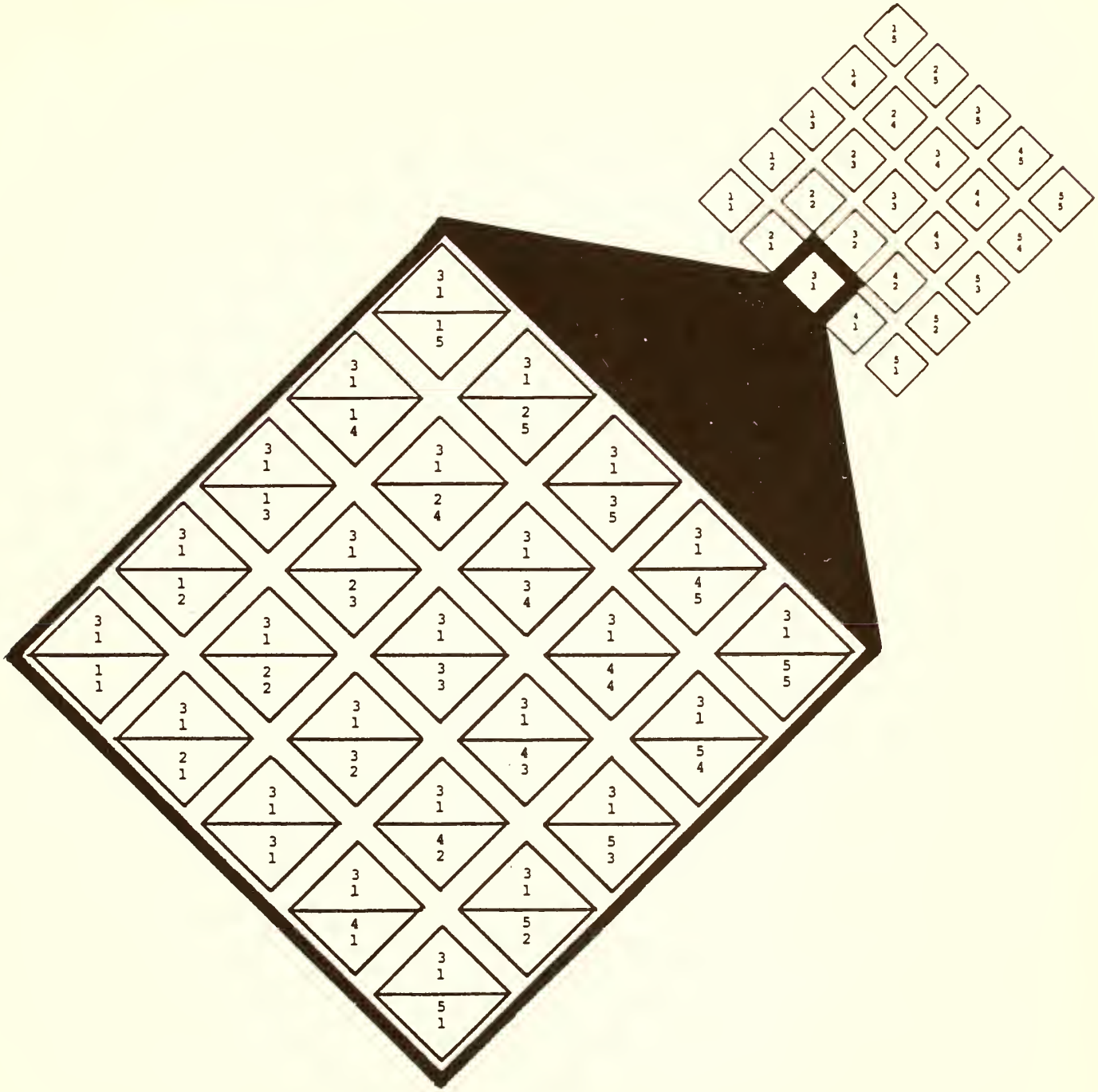
3. On the basis of these ratings, the fish is assigned to the appropriate group.

Expansion of the Similarities Framework

While the edibility framework can encompass all species of fish, they will not be equally distributed in each of the groups. If a large number of fish are present in a single group, it may be necessary to subcategorize them. Each of the 25 primary groups can be "magnified" independently to include an additional pair of edibility factors. Figure 5 illustrates how, by the same process used to sort the primary groups, each species within a group may be sorted again for an additional pair of factors. This adds more information to what is already provided.

As shown in Figure 5, all the fish in the 3/1 group share and retain their rating for the first two factors (average flavor/very flaky), while two more factors are added. Up to 25 additional subgroups can be established in which each fish is identified on the basis of 4 factors instead of just 2.

"MAGNIFICATION" - EXPANSION OF SIMILARITIES FRAMEWORK



3 AVERAGE FLAVOR	3 AVERAGE FLAVOR	3 AVERAGE FLAVOR	3 AVERAGE FLAVOR	3 AVERAGE FLAVOR	FACTOR A
1 FLAKY	1 FLAKY	1 FLAKY	1 FLAKY	1 FLAKY	FACTOR B
1 LOW FAT	2 MODERATELY LOW FAT	3 AVERAGE FAT	4 MODERATELY HIGH FAT	5 HIGH FAT	FACTOR C
1 FIRM	2 MODERATELY FIRM	3 AVERAGE FIRMNESS	4 SLIGHTLY FIRM	5 SOFT	FACTOR D

Factor Selection

Eight factors have been used to generate the edibility profiles. Two factors are used as the basis for identifying similar groups of finfish. As in all organizations of this type, some priorities must be established and a determination made as to which pair of factors will have primary ranking. Selection of the two factors is pivotal since it dictates the character of the differences among the 25 groups. Selecting a different pair of factors will result in fish being sorted into different groups.

Factor selection is determined by how the products are shopped. That is, by determining which information is most important for the shopper to look for first. In our research, more than 270 factors were considered. Consumers and industry were surveyed to determine which factors were felt to be most important. The results of the surveys, and industry recommendations provided the guidelines for the following factor priorities which we used in this model:

FIRST PRIORITY FACTORS

FLAVOR
FLAKINESS

SECOND PRIORITY FACTORS

FAT
FIRMNESS

THIRD PRIORITY FACTORS

ODOR
COARSENESS

FOURTH PRIORITY FACTORS

COLOR
MOISTURE

Both the factors and the ratings are subject to further review and verification. Based on this data, several observations have been made that are considered significant and should be investigated further:

* The species rated in this study exhibit a wide diversity of edibility profiles. Only a small percentage have profiles identical to another species. No large patterns of similarity emerged from the comparison of the edibility profiles.

* Edibility characteristics have little or no direct correlation with zoological categories (comparative edibility does not equal comparative anatomy). In experimenting with combinations of factors, we found that by including factors such as body SHAPE, and types of BONES (essentially, anatomical characteristics), groups were formed that are much more similar to zoological groups. When edible characteristics are considered exclusively, the relationship with zoological classifications becomes insignificant.

* Each of the edibility factors (as qualitatively rated), appears to be relatively independent of the others; for example, variations in the FAT content of the species do not appear to relate directly to other factors.

* The majority of species in our sample tend to cluster around the left side of the edibility framework. Most have relatively mild and flaky meat. Only a few are near the extremes of strong tasting and non-flaky meat.

This identification framework provides a simple way for shoppers to have useful information about seafood species and products.

Looking to the future, when a comprehensive identification program has been developed, a compatible program for showing consumers how to use it will be developed as well. One key documument of this program will be a "Seafood Product Shopping Guide" which will give a complete description of the program. Indices A through E in this report are typical of the kinds of information that can be provided in the shopping guide.

The indices are cross-referenced listings of common names, scientific names and edibility information. They illustrate how the edibility characteristics are necessary to give meaning to the names. They show how the SSP framework and the edibility profiles provide useful information that can ease the task of shopping intelligently for seafood products. They provide consumers with several different ways to go about shopping for seafood products, as follows:

Index A--This is an organization of all edible finfish in the sample by groups at the SSP level. This is the most important index since it enables consumers to shop by edibility characteristics rather than by species. A consumer may prefer a mild tasting fish with very flaky meat. All the species that share those characteristics are listed under the appropriate group.

Index B--This index is organized first by factor and second by rating. It enables shoppers to look for any characteristic such as, high FAT content, and find all the fish which share that characteristic.

Index C--This is an alphabetical listing by common name. Between the common name and the scientific name, the numerical ratings are given for each of the edibility factors. This can help a shopper find the edibility characteristics of an unfamiliar fish.

Index D--This is a listing of species by zoological category and scientific name. This can enable a shopper to evaluate a group such as flatfish, and determine the range of edibility properties that can be found within the group. It can also enable a shopper to determine the edible characteristics of a product which is identified only by the scientific name of a species.

Index E--This is a common name listing of shellfish species, in which the names are organized by major zoological groups. This shows how shoppers can use zoological groupings of shellfish to find relatively similar species of shellfish.

The organizational framework, described in this section, requires a compatible nomenclature system to communicate its message. The following section describes a model of this nomenclature system, identifies major aspects necessary for effective product identification and offers recommended principles which will make seafood product identification more effective.

A SYSTEM OF NAMES FOR SEAFOOD SPECIES

Definition and General Criteria

Nomenclature is defined in "Webster's Third International Dictionary" as:

> "A system or a set of names or designations used in a particular science, discipline or art and formally adopted or sanctioned by the usage of its practitioners."

This definition includes three important principles: 1) the need for an organized, comprehensive system of names, 2) the nomenclature system should be developed for the convenience of its users, and 3) the system should be formally adopted. The seafood industry and seafood consumers constitute a body of practitioners who need their own nomenclature system. Since an effective system of names for seafood products does not currently exist, one must be constructed.

Webster's defines a name as:

> "A word or words by which an entity is identified and distinguished from others."

This nomenclature model is a system of names organized to enable shoppers to identify seafood products and distinguish them from one another and from non-seafood products. To do this effectively, a system of "market names "--names approved for marketing--must be established, and several conditions must exist:

- Each item (species and product) to be named must be given an approved market name.
- Only one market name should be assigned for each item. More than one name will create confusion.
- Each market name must be unique. No two market names should be identical, although they may be similar if the items are similar.
- Each name must be defined in terms of what it identifies and how it is used.
- Names and the use of names must be consistent (standardized) throughout the area of use.

The seafood product mix is so extensive and complex that it requires a sophisticated naming system in order to reduce the confusion and to help clarify, for shoppers, what is there. One of the functions of names is to separate things that should be distinguished. Another equally important function is to establish relationships among similar things. Two kinds of relationships have to be established in the product identification framework, vertical and horizontal:

1. Vertical distinctions among the three product categories are made by using a different kind of name on each level.

2. Horizontal distinctions are made by using a different variation of a particular kind of name within each category.

The nomenclature strategy proposes development of a strong relationship between the ISP and the SSP levels. A single-word, BASE name is assigned to each group at the SSP level. This BASE name is carried vertically down to the ISP level, and with the addition of a modifying term, is used to establish the market name for each species. A less direct relationship is maintained with the MSP level. Names on the MSP level are distinguished by being generally descriptive rather than specific. Figure 6 illustrates the naming strategy developed for this model.

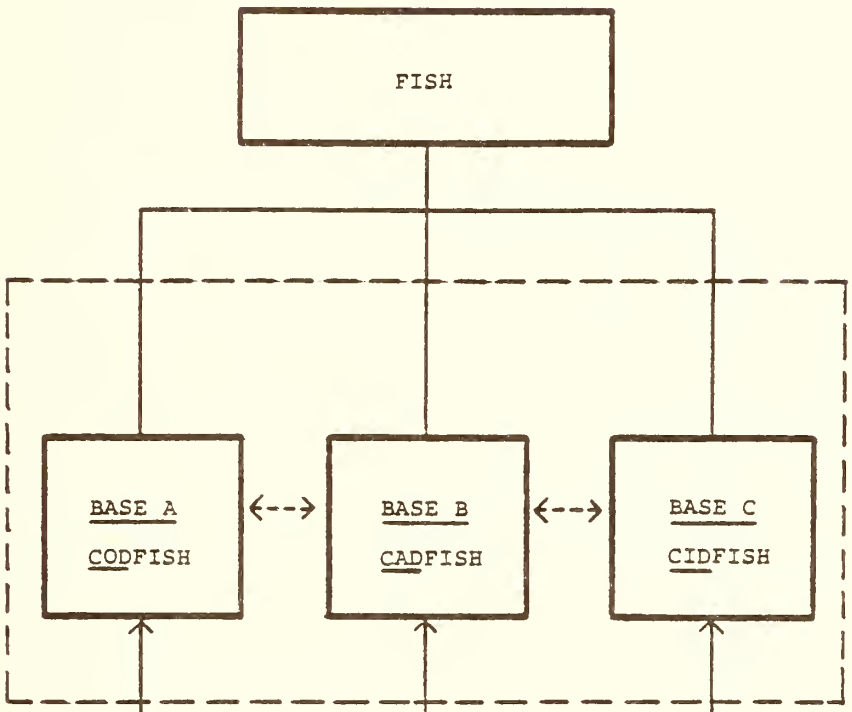
With very little education, using different names to distinguish the three product categories will help consumers tell at a glance whether the product is made from an individual species, a similar group of species or a mixture of species with different edible characteristics. Using variations of a particular kind of name helps in identifying specific products within a category.

The naming system is based directly on the edibility framework described in the previous section. In essence, the framework is constructed first and then names applied to it; just as the streets of a city are first laid out and then named.

The names developed for this framework ultimately reach the consumer as part of the information on a package label. The functions of identification and labeling require that such information be brief, quickly recognizable, informative and accurate in representing the product within the package.

Figure 6

SEAFOOD SPECIES NAMING STRATEGY *



MSP
Mixed
Species
Products

SSP
Similar
Species
Products

ISP
Individual
Species
Products

MODIFIERS	BASE A	MODIFIERS	BASE B	MODIFIERS	BASE C
ATLANTIC	COD	NORTHERN	CAD	FLORIDA	CID
PACIFIC	COD	REX	CAD	GULF	CID
WINTER	COD	LITTLE	CAD	SPOTTED	CID
SILVER	COD	RAINBOW	CAD	BROOK	CID
SPECKLED	COD			OCEAN	CID

* The term Base Name refers to that part of the name which acts as a noun, and Modifier refers to that part of the name that acts as a descriptive adjective. The names COD or CODFISH are considered Base Names. The Base Names CADFISH and CIDFISH have been invented for illustration in this model. Terms such as Atlantic, Pacific, Little, Spotted, etc. are considered Modifiers. Many similar fish will share a Base Name, however, only a single species will be assigned a particular Modifier Base combination.

Other elements also appear on package labels, such as company names, brand names and promotional copy, which serve the requirements of marketing. Ingredient lists, nutritional tables, price and portion markings, and other information are addressed to the needs of consumers. The special function of the product identification element in a multipurpose label is to provide a word or words that enable a person to identify an item and distinquish it from others. It is this particular component of labeling which the nomenclature system provides. The following describes the nomenclature system for finfish and shellfish in each of the three product categories.

Finfish and Shellfish Market Names--Mixed Species Products (MSP Level)

MSP Level-- All products are identified by a generally descriptive BASE name. Base names may be modified by appropriate terms.

A variety of BASE names can be used for MSP products. BASE names on the MSP level will not describe edible relationships, but several other opportunities are available:

* Generic Terms--such as, FINFISH, SHELLFISH or just FISH. These will be used with other product descriptions as necessary to create product identifi-

cation. These names indicate that the product is made from a mix of aquatic species with different edible properties.

* Vernacular Names--such as, TUNA, SNAPPER, MACKEREL, FLATFISH, ROCKFISH, SCROD, etc. Scores of base names such as these are in use, although they are frequently not defined clearly. By clarifying the definition, these names could be used for products at the MSP level since they do not describe edible characteristics.

* Fanciful Names--such as, REEF BURGERS, SEAFARING STICKS, TIDALWAVE TIDBITS, etc. For certain products at the MSP level, it is only necessary to indicate that the product is based on seafood species rather than land animals or vegetables. Many names of this type may actually be proprietary brand names, owned by an individual processor. If consistent guidelines for using them are established, they can provide effective product identification.

BASE terms may be used with other product descriptions to create product identification. For example: FISH CAKES, SHELLFISH GUMBO, ROCKFISH STICKS, FROZEN FILLETS of FLATFISH, etc. In addition, BASE names can be modified in a variety of ways to help characterize the product even further, for instance: NORTH ATLANTIC SHELLFISH STICKS, FRESH WATER FISH PATTIES, etc.

Many products in the MSP level that will be in the market five years from now do not exist today. Developing detailed guidelines for naming products in this category will require a comprehensive audit of current products and a projective analysis of the types of products yet to be developed. Even with that, naming guidelines must be kept flexible. The primary objective will remain: to provide effective and informative product identification while not limiting the potential for new product development.

The product identification framework has been designed to enable a shopper to shop for everything from mixed species products at the MSP level to individual fish at the ISP level. If all seafood species were identical or very similar, the MSP level would be enough. The SSP and the ISP levels are necessary to enable the identification of products in a way that adequately expresses important similarities and differences.

The SSP and the ISP levels are closely related by virtue of the edibility characteristics of the species. The MSP level enables the identification of a diverse array of products. Products in this category include a mixture of species with different edible characteristics, even a mixture of finfish and shellfish. Identifying a particular species at this level is relatively uninformative. The following describes two separate naming systems at the SSP and ISP levels. The first is to identify shellfish products. It is based on the existing zoological framework and vernacular names. The second is to identify finfish products. It is based on the edibility framework described in the previous section and on a new naming system which has been designed to meet the needs of seafood consumers and the seafood industry.

Shellfish Market Names--Similar Species Products (SSP Level)

Zoological categories for shellfish offer a reasonable basis for identifying shellfish products at the SSP level. Figure 7 indicates BASE names that are currently widely used and recognized by consumers for shellfish across the United States. For the most part, there is a direct relationship that is clearly recognized between these BASE names and the appropriate zoological group. BASE names for one category are seldom misused for another category (i.e., shrimp are rarely mistaken for oysters). To assure effective product identification, a few logical conventions for using existing names will be necessary. The following format is recommended for a model:

* The names CLAM, LOBSTER, OYSTER, CRAB, SQUID, OCTOPUS, etc. constitute a a series of viable BASE names for identifying similar species of shellfish. These BASE names are to be used to identify products which include species from a single group. Examples of possible product names include:

  LOBSTER Bisque
  Breaded SHRIMP Sticks
  CLAM Gumbo
  Raw OYSTERS Packed in Brine

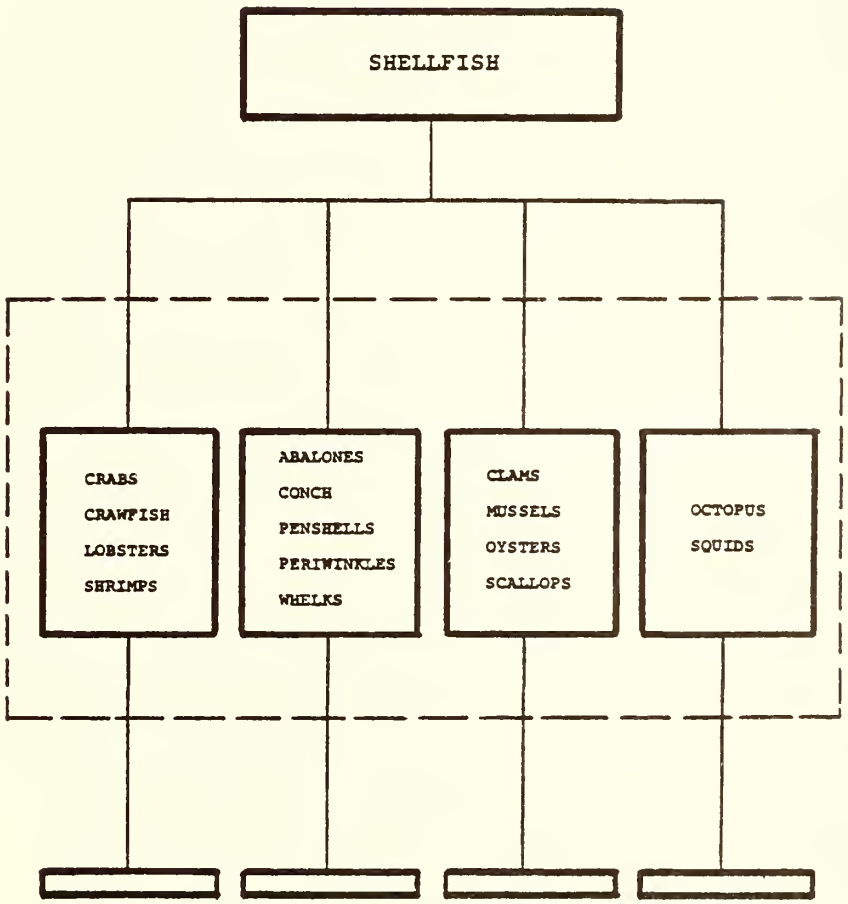
* When species from different shellfish groups are combined in a product (MSP level), either a general name such as SHELLFISH can be used or alternatively, an appropriate combination of group names will be presented on the product label, for example:

  A) SHELLFISH Chunks in Tomato Sauce

  B) Chunks of CLAM, OYSTER and SQUID in Tomato Sauce

Figure 7

SHELLFISH MARKET NAMES



MSP
Mixed
Species
Products

SSP
Similar
Species
Products

ISP
Individual
Species
Products

King CRAB
Blue CRAB
Tanner CRAB

Red CRAWFISH

Maine LOBSTER
African LOBSTER

Gulf SHRIMP
Pink SHRIMP

Shellfish Market Names--Individual Species Products (ISP Level)

For identifying products made from individual species of shellfish, a MODIFIER is added to the BASE name to provide a market name for the individual species. This is consistent with the typical structure of most vernacular names for finfish and shellfish which are currently in use, for example:

KING + CRAB
MAINE + LOBSTER
CHESAPEAKE BAY + OYSTERS

A product made from a single species of shellfish is given a name that is comprised of a MODIFIER preceding a BASE name to identify the species, along with other information necessary to distinguish the product, such as:

KING CRAB Legs
Chunks of TANNER CRAB
CHESAPEAKE BAY OYSTERS In Brine

An effective identification system for shellfish appears to be fairly easy to develop. For the most part, traditional vernacular names and the framework of zoological classifications will provide an effective basis. Special cases are relatively rare and can be handled individually. Further analysis may indicate the need for developing subgroups of shellfish species. At that time, more appropriate market names may be developed for the subgroups.

Finfish Market Names--Similar Species Products (SSP Level)

Due to the uniquely complex nature of finfish species and products, existing vernacular names do not provide an effective naming system. Specific reasons will be outlined in the recommendations at the end of this report. This section describes the model naming system that has been designed to provide more effective identification.

Two kinds of identification are available at the SSP level: a) Edibility Description and b) BASE names.

Edibility Descriptions--Clear, direct descriptions of the primary edible characteristics (intensity of FLAVOR and FLAKINESS), can be provided directly on the label. Figure 8 illustrates an index of "standardized" descriptions. Products made of species from the same edibility group can be identified by using the appropriate combination as follows:

Fish Sticks--
MILD and FLAKY

Fish Sticks--
EXTRA MILD
MODERATELY FLAKY

If a group encompasses so many species that it becomes necessary to "magnify" the group into a series of subgroups, an additional pair of factors will be used to discriminate among the subgroups. Each species can then be identified by a set of four edibility factors, for example.

Fish Sticks--
EXTRA MILD
MODERATELY FLAKY
AVERAGE FAT
MODERATELY FIRM

Figure 8

Factor Ratings FLAVOR - FLAKINESS	EDIBILITY DESCRIPTIONS
1-1	MILD AND FLAKY
1-2	MILD AND MODERATELY FLAKY
1-3	MILD AND AVERAGE FLAKINESS
1-4	MILD AND SLIGHTLY FLAKY
1-5	MILD AND NOT FLAKY
2-1	MODERATELY MILD AND FLAKY
2-2	MODERATELY MILD AND MODERATELY FLAKY
2-3	MODERATELY MILD AND AVERAGE FLAKINESS
2-4	MODERATELY MILD AND SLIGHTLY FLAKY
2-5	MODERATELY MILD AND NOT FLAKY
3-1	AVERAGE FLAVOR AND FLAKY
3-2	AVERAGE FLAVOR AND MODERATELY FLAKY
3-3	AVERAGE FLAVOR AND AVERAGE FLAKINESS
3-4	AVERAGE FLAVOR AND SLIGHTLY FLAKY
3-5	AVERAGE FLAVOR AND NOT FLAKY
4-1	MODERATELY STRONG AND-FLAKY
4-2	MODERATELY STRONG AND MODERATELY FLAKY
4-3	MODERATELY STRONG AND AVERAGE FLAKINESS
4-4	MODERATELY STRONG AND SLIGHTLY FLAKY
4-5	MODERATELY STRONG AND NOT FLAKY
5-1	STRONG AND FLAKY
5-2	STRONG AND MODERATELY FLAKY
5-3	STRONG AND AVERAGE FLAKINESS
5-4	STRONG AND SLIGHTLY FLAKY
5-5	STRONG AND NOT FLAKY

Edibility descriptions can be used alone or in combination with other names to describe the characteristics of any level of product.

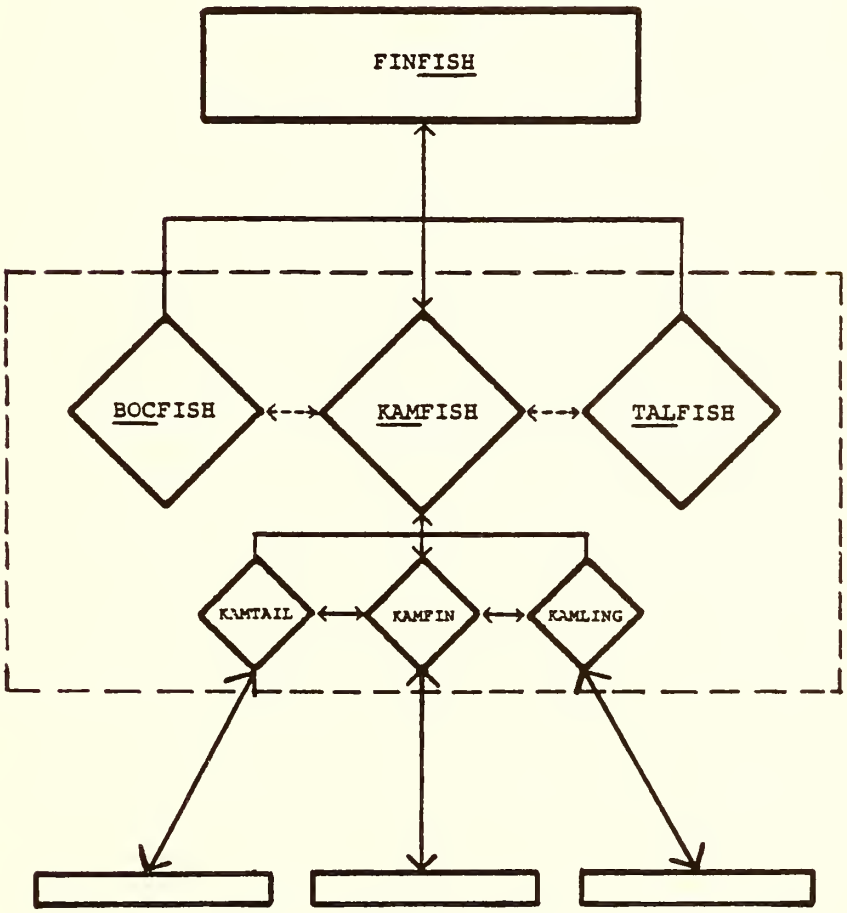
B. BASE names--For greater convenience, a BASE name has been developed for each of the edibility groups and subgroups in the edibility framework. Products on the SSP level can be identified with these BASE names since BASE names are equivalent to the Edibility Descriptions. Guidelines for using BASE names are as follows:

SSP Level--These products are assigned an appropriate and unique BASE name. These BASE names will be a single, one-word name. Each edibility group will have a separate BASE name. The number of BASE names will be determined by the number of groups and subgroups identified in the edibility framework.

The BASE name can be used with, or as a replacement for edibility descriptions. For vertical consistency, to distinguish products on the SSP level from products on the MSP or the ISP level, BASE names are all single-word names. For horizontal consistency, all BASE names in this model have the same structure. It consists of the suffix -FISH, preceded by a three-letter, phonetic prefix which has no particular meaning. The BASE names developed for this model are illustrated in figure 9.

Figure 9

FINFISH MARKET NAMES



Groups which have been "magnified" by including a second pair of factors are also identified by a single-word BASE name. BASE names for these subgroups have been derived from the phonetic prefix used to identify the group. A modified prefix is used to make a BASE name for the subgroup. This structural convention assures that a strong, obvious relationship will be maintained between the subgroups and the primary groups. This horizontal consistency assures that it will be immediately clear to consumers that products are based on related groups of species. Products on the SSP level can be identified by the edibility description, by the BASE name of the group or subgroup, or by a combination of both. In special cases, where it may be necessary to include supplementary identification of species, a number of options are available; for example, the vernacular or scientific name of the species may be included in the ingredients listing on the label.

Finfish Market Names--Individual Species Products (ISP Level)

ISP Level--Products based on a single species of finfish are labeled with a two-word Market Name consisting of a BASE name from the appropriate edibility group, preceded by an appropriate MODIFIER.

At the ISP level, consistent "horizontal" identification is maintained by using the same structure for all species names. Strong vertical relationships are maintained with the appropriate group by using the group BASE name as the root for the species name. Any number of individual species names can be assigned, depending on how many species require identification in the marketplace. More names can be added as more commercial species are developed.

Control and Regulation

For the identification system to be effective, it must be used consistently on a national basis.

The identification system provides a unique Market Name for each species, product and category of products requiring identification. The edibility framework provides the organization that makes the names meaningful. It also provides clear-cut boundaries by which accurate labeling can be easily established and regulated, and mislabeling avoided.

Standards of identification will not allow the interchanging of names horizontally. For example, a product made from species exclusively derived from one edibility group could not be labeled with a name or edibility description from another edibility group.

Vertically, a product could be labeled with a more general term but not with a more specific term. For example, a fish stick made from three species from group A could be named Surf Sticks (MSP) but could not be named with only one of the species names (ISP). A product based on an individual species (ISP) can be identified with a name from the SSP or the ISP level. A product based on similar species (SSP) can be named with a MSP name but not with an ISP name. MSP products can only be identified with MSP names. In practice, some variations would occur in these general principles, for instance: a product based on several species from one group (SSP) can not be identified with the name of one species since more than one species are actually present. If only two or three species are included, the label may identify each of them by name. At the MSP level, an appropriate combination of group names or species names can be used.

Ease of Use

The edibility framework and the nomenclature system make it easy for shoppers to identify and distinguish among the entire selection of seafood products.

It is only necessary to learn a few basic principles in order to make intelligent shopping decisions. Instructions will be provided by a consumer education program which will be conducted in conjunction with the introduction of the identification system. Even consumers who know little or nothing about seafood species and products will find the identification system informative and easy to use.

Further Development of the Identification System

Development and implementation of the identification system requires further commitment on the part of the seafood industry, regulatory agencies and consumers. Edibility characteristics, ratings and priorities must be carefully reevaluated. The organizational framework, based on edibility characteristics, must be carefully evaluated on the basis of a more comprehensive audit of seafood products. Finally, a detailed naming system must be developed, approved, and put into use.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The initial project was actually begun in 1974 with U.S. Government Contract #4-36730. The assignment was to see if acceptable and workable resolutions to a wide variety of nomenclature problems could be found. The problems were evaluated by BGI and set in a broader perspective that would include all seafood products and species. From this was derived the basic format for a comprehensive program of organization and identification that encompasses seafood species, seafood products and nomenclature.

This project, U.S. Government Contract #6-35338, addressed the most complex component of the overall program, i.e., the identification of seafood species. The work performed by BGI clearly establishes the validity and methodology of a seafood identification program.

It is our conclusion that implementation of the following recommendations will provide consumers and the seafood industry with a system that will significantly increase the utilization of aquatic species as a primary source of food.

Primary Recommendations

The overall recommendation of BGI is that NMFS immediately establish a programmatic thrust on a permanent basis to actively develop, implement, and evaluate the directions that have been substantiated by these projects.

In this current project, a model of the most basic aspect of the product identification plan has been developed for identifying and organizing various edible aquatic species. Now it is time to establish a more permanent vehicle to undertake the development of the total identification program. Budgeting for past projects has largely been provided by NMFS on allocations from limited reserves of discretionary funds. It is essential to secure an ongoing commitment for such important programs and to capitalize on and protect the investment already made.

Reaction to this opportunity must be rapid. Many individuals nationally and internationally have expressed sincere, immediate interest, and the momentum should not be lost. If no further effort is made soon, it will be doubly difficult to regenerate interest.

NMFS should spearhead these efforts. No other agency is in a position to bring together the expertise, cooperation, and support necessary to develop the programs effectively. It is now time for NMFS to incorporate a programmatic thrust. It may be within the current Standardization Program or within the Product Quality, Safety and Identification Program related to Standardization.

A naming authority should be established within NMFS as a chartered activity. This will establish a standard setting function and will enable NMFS to act as a clearing house on matters pertaining to seafood product identification and nomenclature.

Other Recommendations

In conjunction with establishing a permanent program for development of an identification system, BGI recommends immediate and concurrent initiation of three specific program components:

1. Develop a comprehensive and consistent data bank of edibility profiles and related information for all commercial aquatic species.

2. Develop guidelines and procedures for making interim decisions on seafood product labeling and nomenclature.

3. Develop an interim program for marketing seafood products on the basis of communicating edibility information.

The following sections will provide a more complete analysis and justification of recommendations 1, 2 and 3.

SPECIFIC RECOMMENDATION #1

Develop A Comprehensive Data Bank of Edibility Profiles

In this report the term edibility profile has been used in reference to a set of factors and ratings that provide a composite general picture of the characteristics of the meat of various seafood species. Based on empirical data, a tentative set of ediblity profiles have been developed for this model, to illustrate how data derived from them may be used in developing an identification system.

Edibility profiles and the identification plan are independent concepts. An identification system can be based on many other kinds of factors (i.e., anatomical, environmental, etc.) but it would not be as informative and useful to consumers.

The key program that should be started first is the structuring and loading of a comprehensive data bank of edibility profiles for all commercial species.

The assembly of a complete set of edibility profiles on a consistent and objective basis for all commercial species is potentially so important to the seafood industry and consumers that it should begin immediately.

This data bank will be useful not only in providing a basis for an identification plan but in helping to resolve current naming and marketing problems related to seafood products, in providing an effective basis for educating consumers about seafood products, and in many other ways as well.

Before data can be collected, however, edibility factors must be more clearly defined and objective, consistent rating procedures must be found or developed. This program should begin with the determination of the optimum set of factors to provide a composite, general picture (profile) of the edible characteristics of the entire spectrum of commercial finfish. Ultimately, it may be worthwhile to include shellfish in this effort as well. The factors selected must be capable of being clearly defined and must be subject to objective measurement techniques that will produce consistent results.

In most cases, both objective and subjective techniques are available for measuring edibility factors. It must be possible for anyone following the proper procedure to arrive consistently at the same rating for each factor for each species.

The ratings established by dependable laboratory techniques, should be validated through tests by consumer panels.

SPECIFIC RECOMMENDATION #2

Develop Guidelines and Procedures for
Interim Changes in Existing Nomenclature

In the absence of a consistent identification program, problems frequently arise concerning the development of effective names that are also legally acceptable. It sometimes takes years before a decision is finally reached. Too often, viable products and species are withheld from the marketplace in the meantime. An immediate effort should be undertaken to develop a working procedure for making interim naming decisions on a cooperative basis by involving the seafood industry, NMFS, FDA and consumers.

Background and Problems

Vernacular or common names are the traditional means for identifying individual species of finfish and shellfish. Only a relatively small percentage of the many names in use are widely known or accepted throughout the United States. Others provide little useful information for shoppers and are frequently confusing and misleading.

Each species has at least one common name, most have more than one, a few have dozens or more. Even if each species had only one name, there would still be too many for consumers to learn and remember.

There are several problems with existing common names that make them largely ineffective for retail identification. Most of the problems fall into the following categaories:

Too Many Names--Many edible species have more than one common name in current use, usually in different parts of the country. For accurate identification in the marketplace, only a single name should be in use for an individual species.

Same Names and Similar Names--Numerous instances exist where several species share identical names. The name Butterfish, for example, is used for at least five different species, all from different zoological families. In addition, many species have names which are similar or which suggest relationships that may not exist, or may be too obscure to be useful to shoppers; for instance, Perch and Bass are used for a large number of unrelated species.

Unattractive and Unfamiliar Names-- A moderate number of edible species have unmarketable names, such as Gag, Ratfish, Dogfish, Cancer Crab, Rattail, and others. There is little question that attempts to market the species under these names would be impossible, inspite of desirable edible characteristics they have.

Consumers are reluctant to try unfamiliar species of fish, and even frequent users of seafood products in the United States limit their choices to a relatively few "dependable" species. Most simply are not aware that a great many similar species may be available.

Labeling regulations

Current Federal labeling regulations under the Food, Drug and Cosmetics Act, administered by the Food and Drug Administration, are intended to insure that food product labels provide the customer with sufficient information to provide accurate product identification and enable intelligent, comparative shopping. The Act provides that a food product must be labeled by its "common or usual name," if one exists. This is intended to prevent commonly known products such as flour, from being marketed under confusing or misleading names such as "wonder dust."

Until an effective identification system can be implemented, edibility profiles can provide the basis for developing an actionable program for resolving naming problems on an interim basis. The guidelines for making interim changes in common names should place emphasis on salient

edible characteristics, in keeping with the long-range objectives of the identification system. This will immediately reduce the current total dependence on the common name as the primary means of seafood product identification and information. Referring to edibility characteristics consistently will tend to increase understanding in the area of seafood product names.

These recommendations do not imply that individual changes in common names can provide adequate market identification. The names alone are of little use since there are so many. Within a framework such as Comparative Edibility, names take on real meaning for shoppers. Edibility profiles give shoppers important new information about species and provide many new options for making satisfying purchases. With this in mind, several principles can be proposed:

* Flexible Decisions--Naming decisions made prior to the development and implementation of an identification system should be considered as temporary, subject to change at a later date.

* Joint Decisions--The National Marine Fisheries Service should work with interested industry groups to develop precise recommendations for review with regulatory and consumer representatives.

* Edibility Framework--Decisions on naming should reinforce edibility relationships, unless doing so would create undue confusion.

SPECIFIC RECOMMENDATION #3

Develop Interim Marketing Directions

The seafood industry has traditionally been thought of as small and relatively "insignificant" compared to other food industries (i.e., "Fish is not important as meat in the American diet.")

Compared on the basis of annual sales, the seafood industry is fractionally the size of the meat industry. Potentially, the seafood industry can become a much more significant factor, even a dominant factor compared to other food categories. Several conditions now exist that contribute to this potential:

- The enormous variety of seafood species and products that are available far outreaches the variety offered by other food industries

- The recent initiation of the American 200 mile fishing limits gives U.S. fishermen control of one of the world's greatest seafood resources.

- The American consumer could and would eat more fish if they were marketed more effectively

On an interim basis, the seafood industry should begin identifying and promoting seafood species and products by means of comparing edible characteristics. Several benefits will be accomplished by starting now to implement these directions within the industry:

* During the time an identification system is being developed, the industry can educate consumers to think in terms of edibility information.

* Recognizing the potential benefits of marketing seafood products on the basis of edibility information will encourage the development of a more sophisticated and useful data bank of edibility profiles.

* This will also provide the long missing common ground on which seafood products can be marketed more effectively relative to other food products.

Index A

FINFISH LISTED BY EDIBILITY CHARACTERISTICS

COMMON NAME	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	SCIENTIFIC NAME
1-1 MILD AND FLAKY									
Yellowtail Snapper	1	1	1	1	1	1	2	4	Ocyurus chrysurus
Black Grouper	1	1	2	2	1	2	3	4	Mycteroperca bonaci
Atlantic Cod	1	2	1	1	1	1	2	4	Gadus morhua
Cusk	1	2	1	1	1	1	2	4	Brosme brosme
Haddock	1	2	1	1	1	1	2	4	Melanogrammus aeglefinus
Spotted Cabrilla	1	2	1	1	1	1	3	3	Epinephelus analogus
Pacific Halibut	1	2	2	2	1	1	2	3	Hippoglossus stenolepis
Ocean Whitefish	1	2	1	1	1	2	2	4	Caulolatilus princeps
Scamp	1	2	1	1	1	2	3	5	Mycteroperca phenax
Giant Sea Bass	1	3	2	2	1	2	3	4	Stereolepis gigas
1-2 MILD AND MODERATELY FLAKY									
White Seabass	1	1	2	2	2	2	3	3	Cynoscion nobilis
Witch Flounder	1	1	1	1	2	3	1	4	Glyptocephalus cynoglossus
White Crappie	1	1	1	2	2	3	2	4	Pomoxis annularis
Bluegill	1	1	2	2	2	3	1	4	Lepomis macrochirus
Channel Catfish	1	2	1	1	2	1	2	4	Ictalurus punctatus
Alaska Pollock	1	2	1	2	2	1	2	4	Theragra chalcogramma
Pacific Ocean Perch	1	2	1	2	2	2	3	3	Sebastodes alutus
Southern Flounder	1	2	1	1	2	3	1	4	Paralichthys lethostigma
Walleye	1	2	1	2	2	3	1	3	Stizostedion vitreum vitreum
Rainbow Trout	1	3	1	2	2	2	1	3	Salmo gairdneri
Brook Trout	1	3	1	2	2	2	2	4	Salvelinus fontinalis
Lake Whitefish or Common Whitefisn	1	3	1	1	2	3	1	4	Coregonus clupeaformis

1-3 MILD AND AVERAGE FLAKINESS

Yellowtail Flounder	1	1	2	1		3	1	1	4	Limanda ferruginea
Petrale Sole or Brill	1	1	1	1		3	2	1	4	Eopsetta jordani
Rex Sole	1	1	1	1		3	2	1	4	Glyptocephalus zachirus
Summer Flounder or Fluke	1	1	1	1		3	2	1	4	Paralichthys dentatus
Dover Sole	1	1	1	1		3	3	1	4	Microstomus pacificus
Rainbow Smelt	1	2	1	2		3	3	1	4	Osmerus mordax
Pacific Sanddab	1	2	2	1		3	4	1	4	Citharichthys sordious
Pigfish	1	3	1	2		3	2	3	4	Orthopristis chrysopters

1-4 MILD AND SLIGHTLY FLAKY

White Hake	1	3	2	1		4	5	2	4	Urophycis tenuis

1-5 MILD AND NOT FLAKY

- -

2-1 MODERATELY MILD AND FLAKY

Snook	2	1	1	1		1	1	2	4	Centropomus undecimalis
Vermillion Snapper	2	1	1	2		1	1	2	4	Rhomboplites aurorubens
Sauger	2	2	1	1		1	1	1	4	Stizostedion canadense
Red Snapper	2	2	1	1		1	1	2	4	Lutjanus campechanus (Black fordi)
Atlantic Halibut	2	2	1	2		1	1	2	3	Hippoglossus hippoglossus
Gag	2	2	1	1		1	1	3	4	Mycteroperca microlepis
Nassau Grouper	2	2	1	2		1	1	3	5	Epinephelus striatus
Jewfish or Spotted Grouper	2	2	1	2		1	1	5	5	Epinephelus itajara
Blackfin Tuna	2	2	2	3		1	1	2	2	Thunnus atlanticus
Yellowfin Tuna	2	2	1	4		1	2	3	2	Thunnus albacares
Black Sea Bass	2	2	2	2		1	2	3	4	Centropristas striatus
Bigmouth Buffalo	2	3	1	2		1	1	2	5	Ictiobus cyprinellus
Smallmouth Buffalo	2	3	1	2		1	1	3	5	Ictiobus bubalus
Atlantic Salmon	2	3	2	3		1	1	2	3	Salmo salar

Bluefin Tuna or Horse Mackerel	2 3 2 5	1 1 3 2	Thunnus thynnus
Sheepshead	2 3 1 2	1 2 3 3	Archosargus probatocephalus
Albacore Tuna	2 4 1 3	1 1 2 2	Thunnus alalunga

2-2 MODERATELY MILD AND MODERATELY FLAKY

Tautog or Blackfish	2 1 1 2	2 3 1 3	Tautog onitis
Winter Flounder or Blackback Flounder	2 1 2 1	2 3 1 4	Pseudopleuronectes americanus
Lingcod	2 2 1 1	2 1 2 4	Ophidon elongatus
Blue Catfish	2 2 1 1	2 1 2 5	Ictalurus furcatus
Sand Shark or Ground Shark	2 2 2 2	2 1 3 3	Odontaspis (carcharias) taurus
Sea Catfish	2 2 2 2	2 1 3 5	Galeichthys felis
Black Dogfish	2 2 3 2	2 1 2 3	Centroscyllium fabricii
Striped Bass or Rockfish	2 2 1 2	2 2 3 4	Morone saxatilis
Atlantic Wolffish	2 2 2 1	2 2 3 4	Anarhichas lupus
Gray Triggerfish	2 2 2 1	2 2 3 4	Balistes capriscus
Brown Bullhead	2 2 2 1	2 2 3 5	Ictalurus nebulosus
American Plaice	2 2 2 1	2 3 2 4	Hippoglossoides platessoides
Turbot	2 2 1 2	2 4 1 4	Psetta (scophthalmus) maxima
Florida Pompano	2 3 2 2	2 2 1 3	Trachinotus carolinus
Chum Salmon	2 3 2 2	2 2 3 3	Oncorhynchus keta
Whiting or Northern Kingfish	2 3 2 2	2 2 3 4	Menticirrhus saxatilis
Atlantic Croaker	2 3 3 2	2 2 2 3	Micropogon undulatus
Sierra	2 3 2 3	2 3 2 4	Scomberomorus sierra
Pink Salmon	2 3 4 3	2 3 2 3	Oncorhynchus gorbuscha
Lake Herring or Cisco	2 3 2 2	2 4 1 4	Coregonus artedii
Striped Mullet	2 4 1 2	2 2 1 4	Mugil cephalus
Lake Trout	2 4 1 2	2 2 1 5	Salvelinus namaycush

2-3 MODERATELY MILD AND AVERAGE FLAKINESS

Ocean Pout	2	1	2	2	3	1	2	4	Macrozoarces americanus
White Perch	2	1	1	2	3	2	2	3	Morone (roccus) americana
Yellow Perch	2	1	1	2	3	2	2	3	Perca flavascens
Arrowtooth Flounder	2	1	2	1	3	3	2	4	Atheresthes stomias
Spotted Seatrout or Speckle Trout	2	2	2	1	3	3	1	4	Cynoscion nebulosus
Silver Hake	2	2	2	1	3	3	2	4	Merluccius bilinearis
Pacific Pollock	2	2	2	2	3	3	2	4	Pollachius virens
Red Hake	2	2	1	1	3	5	1	4	Urophycis chuss
Pacific Hake	2	2	2	1	3	5	2	5	Merluccius productus
Spot	2	3	2	2	3	2	2	4	Leiostomus xanthurus
Greenland Turbot	2	3	2	2	3	3	2	4	Reinhardtius hippoglossoides

2-4 MODERATELY MILD AND SLIGHTLY FLAKY

Butterfish	2	3	2	1	3	4	1	4	Poronotus triacanthus

2-5 MODERATELY MILD AND NOT FLAKY

Spiny Dogfish	2	3	4	2	5	3	1	3	Squalus acanthias

3-1 AVERAGE FLAVOR AND FLAKY

Atlantic Pollock	3	2	2	2	1	1	2	4	Pollachius pollachius
Little Tunny or False Albacore	3	2	1	4	1	1	3	2	Euthynnus alletteratus
Rockfish	3	2	2	2	1	2	3	3	Sebastodes species
Swordfish	3	3	2	2	1	1	3	2	Xiphias gladius
Carp	3	3	2	2	1	1	3	4	Cyprinus carpio
Black Drum	3	3	2	2	1	1	4	4	Pogonias cromis
Atlantic Bonito or Common Bonito	3	3	2	4	1	1	4	2	Sarda sarda
Sockeye Salmon	3	4	2	4	1	2	2	3	Oncorhynchus nerka
Sablefish	3	5	2	2	1	3	2	5	Anoplopoma fimbria

3-2 AVERAGE FLAVOR AND MODERATELY FLAKY

English Sole	3	1	3	1	2	3	2	4	Parophrys vetulus
Cobia or Brabeater	3	2	2	1	2	1	3	3	Rachycentron canadum
Common Dolphin or Dorado	3	2	2	1	2	2	2	3	Coryphaena hippurus
Ocean Perch (Atlantic) or Rosefish or Redfish	3	2	2	2	2	2	3	4	Sebastes marinus
Cabezon	3	2	2	2	2	2	4	2	Scorpaenichthys marmoratus
Lake Sturgeon	3	3	4	3	2	1	4	3	Acipenser fulvescens
Shovelnose Sturgeon	3	3	4	3	2	1	4	3	Scaphirhynchus platorynchus
Scup or Porgy	3	3	1	2	2	2	2	5	Stenotomus chrysops
Lake Chub	3	4	2	2	2	3	1	4	Hybopsis plumbeua
Coho Salmon	3	4	2	3	2	3	2	4	Oncorhynchus kisutch
Chinook Salmon	3	5	2	4	2	2	2	4	Oncorhynchus tshawytscha

3-3 AVERAGE FLAVOR AND AVERAGE FLAKINESS

Burbot	3	2	1	2	3	3	2	3	Lota lota
Northern Pike	3	2	3	2	3	3	3	3	Esox lucius
Pacific Herring	3	5	4	3	3	4	2	4	Clupea harengus pallasi

3-4 AVERAGE FLAVOR AND SLIGHTLY FLAKY

White Seatrout or Sand Seatrout	3	2	1	1	4	4	1	5	Cynoscion arenarius
Surf Smelt	3	3	1	3	4	3	2	4	Hypomesus pretiosus
American Eel or Silver Eel	3	4	2	2	4	2	1	4	Anguilla rostrata
White Mullet	3	4	3	2	4	3	2	4	Mugil cerema
Crevalle Jack or Common Jack	3	4	4	3	4	3	2	4	Caranx hippos
Atlantic Herring	3	5	3	3	4	3	1	4	Clupea harengus harengus

3-5 AVERAGE FLAVOR AND NOT FLAKY

Monkfish	3	2	2	2	5	2	3	4	Lophius americanus

4-1 MODERATELY STRONG AND FLAKY

Skipjack Tuna or Oceanic Skipjack	4 3 2 4	1 1 3 2	Euthynnus (katsuwonus) pelamis
Pacific Bonito or California Bonito	4 3 3 4	1 1 4 2	Sarda chiliensis

4-2 MODERATELY STRONG AND MODERATELY FLAKY

King Mackerel or Kingfish	4 3 4 2	2 2 2 4	Scomberomorus cavalla
Atlantic Mackerel	4 4 4 3	2 4 2 4	Scomber scombrus

4-3 MODERATELY STRONG AND AVERAGE FLAKINESS

Blue Runner	4 3 4 3	3 3 3 4	Caranx crysos
Jack Mackerel	4 4 2 3	3 3 3 5	Trachurus symmetricus

4-4 MODERATELY STRONG AND SLIGHTLY FLAKY

Spanish Mackerel or Spotted Mackerel	4 4 4 2	4 3 2 5	Scomberomorus maculatus

4-5 MODERATELY STRONG AND NOT FLAKY

- -

5-1 STRONG AND FLAKY

- -

5-2 STRONG AND MODERATELY FLAKY

Redeye Mullet or Silver Mullet	5 4 3 3	2 3 3 5	Mugil gaimardiana

5-3 STRONG AND AVERAGE FLAKINESS

Bluefish	5 4 4 4	3 3 2 4	Pomatomus saltatrix

5-4 STRONG AND SLIGHTLY FLAKY

- -

5-5 STRONG AND NOT FLAKY

Atlantic Menhaden	5 5 5 4	5 5 1 5	Brevoortia tyrannua

Index B

FINFISH LISTED BY RATING FOR EACH FACTOR

FLAVOR intensity

1 Mild

Alaska Pollock
Atlantic Cod
Black Grouper
Bluegill
Brook Trout
Channel Catfish
Cusk
Dover Sole
Giant Sea Bass
Haddock
Lake Whitefish
Ocean Whitefish
Pacific Halibut
Pacific Ocean Perch
Pacific Sanddab
Petrale Sole
Pigfish
Rainbow Smelt
Rainbow Trout
Rex Sole
Scamp
Southern Flounder
Spotted Cabrilla
Summer Flounder
Walleye
White Crappie
White Hake
White Seabass
Witch Flounder
Yellowtail Flounder
Yellowtail Snapper

2 Moderately Mild

Albacore Tuna
American Plaice
Arrowtooth Flounder
Atlantic Croaker
Atlantic Halibut
Atlantic Salmon
Atlantic Wolffish
Bigmouth Buffalo
Black Dogfish
Black Sea Bass
Blackfin Tuna
Blue Catfish
Bluefin Tuna
Brown Bullhead
Butterfish
Chum Salmon
Lake Herring
Florida Pompano
Gag
Gray Triggerfish
Greenland Turbot
Jewfish
Lake Trout
Lingcod
Nassau Grouper
Whiting
Ocean Pout
Pacific Hake
Pacific Pollock
Pink Salmon
Red Hake
Red Snapper
Sand Shark
Sauger
Sea Catfish
Sheepshead
Sierra
Silver Hake
Smallmouth Buffalo
Snook
Spiny Dogfish
Spot
Spotted Seatrout
Striped Bass
Striped Mullet
Tautog
Turbot
Vermillion Snapper
White Perch
Winter Flounder
Yellow Perch
Yellowfin Tuna

3 Average

American Eel
Atlantic Bonito
Atlantic Herring
Atlantic Pollock
Black Drum
Burbot
Cabezon
Carp
Chinook Salmon
Cobia
Coho Salmon
Common Dolphin
Crevalle Jack
English Sole
Lake Chub
Lake Sturgeon
Little Tunny
Monkfish
Northern Pike
Ocean Perch (Atlantic)
Pacific Herring
Rockfish
Sablefish
Scup
Shovelnose Sturgeon
Sockeye Salmon
Surf Smelt
Swordfish
White Mullet
White Seatrout

4 Moderately Strong

Atlantic Mackerel
Blue Runner
Jack Mackerel
King Mackerel
Pacific Bonito
Skipjack Tuna
Spanish Mackerel

5 Strong

Atlantic Menhaden
Bluefish
Redeye Mullet

FAT content

1 Low

Arrowtooth Flounder
Black Grouper
Bluegill
Dover Sole
English Sole
Ocean Pout
Petrale Sole
Rex Sole
Snook
Summer Flounder
Tautog
Vermillion Snapper
White Crappie
White Perch
White Seabass
Winter Flounder
Witch Flounder
Yellow Perch
Yellowtail Flounder
Yellowtail Snapper

2 Moderately Low

Alaska Pollock
American Plaice
Atlantic Cod
Atlantic Halibut
Atlantic Pollock
Atlantic Wolffish
Black Dogfish
Black Sea Bass
Blackfin Tuna
Blue Catfish
Brown Bullhead
Burbot
Capezon
Channel Catfish
Cobia
Common Dolphin
Cusk
Gag
Gray Triggerfish
Haddock
Jewfish
Lingcod
Little Tunny
Monkfish
Nassau Grouper
Northern Pike
Ocean Perch (Atlantic)
Ocean Whitefish
Pacific Hake
Pacific Halibut
Pacific Ocean Perch
Pacific Pollock
Pacific Sanddab
Rainbow Smelt
Red Hake
Red Snapper
Rockfish
Sand Shark
Sauger
Scamp
Sea Catfish
Silver Hake
Southern Flounder
Spotted Cabrilla
Spotted Seatrout
Striped Bass
Turbot
Walleye
White Seatrout
Yellowfin Tuna

3 Average

Atlantic Bonito
Atlantic Croaker
Atlantic Salmon
Bigmouth Buffalo
Black Drum
Blue Runner
Bluefin Tuna
Brook Trout
Butterfish
Carp
Chum Salmon
Lake Herring
Florida Pompano
Giant Sea Bass
Greenland Turbot
King Mackerel
Lake Sturgeon
Lake Whitefish
Whiting
Pacific Bonito
Pigfish
Pink Salmon
Rainbow Trout
Scup
Sheepshead
Shovelnose Sturgeon
Sierra
Skipjack Tuna
Smallmouth Buffalo
Spiny Dogfish
Spot
Surf Smelt
Swordfish
White Hake

4 Moderately High

Albacore Tuna
American Eel
Atlantic Mackerel
Bluefish
Coho Salmon
Crevalle Jack
Jack Mackerel
Lake Chub
Lake Trout
Redeye Mullet
Sockeye Salmon
Spanish Mackerel
Striped Mullet
White Mullet

5 High

Atlantic Herring
Atlantic Menhaden
Chinook Salmon
Pacific Herring
Sablefish

ODOR, raw-fresh

1 Mild

Alaska Pollock
Albacore Tuna
Atlantic Cod
Atlantic Halibut
Bigmouth Buffalo
Blue Catfish
Brook Trout
Burbot
Channel Catfish
Cusk
Dover Sole
Gag
Haddock
Jewfish
Lake Trout
Lake Whitefish
Lingcod
Little Tunny
Nassau Grouper
Ocean Whitefish
Pacific Ocean Perch
Petrale Sole
Pigfish
Rainbow Smelt
Rainbow Trout
Red Hake
Red Snapper
Rex Sole
Sauger
Scamp
Scup
Sheepshead
Smallmouth Buffalo
Snook
Southern Flounder
Spotted Cabrilla
Striped Bass
Striped Mullet
Summer Flounder
Surf Smelt
Tautog
Turbot
Vermillion Snapper
Walleye
White Crappie
White Seatrout
White Perch
Witch Flounder
Yellow Perch
Yellowfin Tuna
Yellowtail Snapper

2 Moderately Mild

American Eel
American Plaice
Arrowtooth Flounder
Atlantic Bonito
Atlantic Pollock
Atlantic Salmon
Atlantic Wolffish
Black Drum
Black Grouper
Black Sea Bass
Blackfin Tuna
Bluefin Tuna
Bluegill
Brown Bullhead
Butterfish
Cabezon
Carp
Chinook Salmon
Chum Salmon
Lake Herring
Cobia
Coho Salmon
Common Dolphin
Florida Pompano
Giant Sea Bass
Gray Triggerfish
Greenland Turbot
Jack Mackerel
Lake Chub
Monkfish
Whiting
Oceal Perch (Atlantic)
Ocean Pout
Pacific Hake
Pacific Halibut
Pacific Pollock
Pacific Sanddab
Rockfish
Sablefish
Sand Shark
Sea Catfish
Sierra
Silver Hake
Skipjack Tuna
Sockeye Salmon
Spot
Spotted Seatrout
Swordfish
White Hake
White Seabass
Winter Flounder
Yellowtail Flounder

3 Average

Atlantic Croaker
Atlantic Herring
Black Dogfish
English Sole
Northern Pike
Pacific Bonito
Redeye Mullet
White Mullet

4 Moderately Strong

Atlantic Mackerel
Blue Runner
Bluefish
Crevalle Jack
King Mackerel
Lake Sturgeon
Pacific Herring
Pink Salmon
Shovelnose Sturgeon
Spanish Mackerel
Spiny Dogfish

5 Strong

Atlantic Menhaden

COLOR after cooking

1 White

American Plaice
Arrowtooth Flounder
Atlantic Cod
Atlantic Wolffish
Blue Catfish
Brown Bullhead
Butterfish
Channel Catfish
Cobia
Common Dolphin
Cusk
Dover Sole
English Sole
Gag
Gray Triggerfish
Haddock
Lake Whitefish
Lingcod
Ocean Whitefish
Pacific Hake
Pacific Sanddab
Petrale Sole
Red Hake
Red Snapper
Rex Sole
Sauger
Scamp
Silver Hake
Snook
Southern Flounder
Spotted Cabrilla
Spotted Seatrout
Summer Flounder
White Hake
White Seatrout
Winter Flounder
Witch Flounder
Yellowtail Flounder
Yellowtail Snapper

2 Light

Alaska Pollock
American Eel
Atlantic Croaker
Atlantic Halibut
Atlantic Pollock
Bigmouth Buffalo
Black Dogfish
Black Drum
Black Grouper
Black Sea Bass
Bluegill
Brook Trout
Burbot
Cabezon
Carp
Chum Salmon
Lake Herring
Florida Pompano
Giant Sea Bass
Greenland Turbot
Jewfish
King Mackerel
Lake Chub
Lake Trout
Monkfish
Nassau Grouper
Whiting
Northern Pike
Ocean Perch (Atlantic)
Ocean Pout
Pacific Halibut
Pacific Ocean Perch
Pacific Pollock
Pigfish
Rainbow Smelt
Rainbow Trout
Rockfish
Sablefish
Sand Shark
Scup
Sea Catfish
Sheepshead
Smallmouth Buffalo
Spanish Mackerel
Spiny Dogfish
Spot
Striped Bass
Striped Mullet
Swordfish
Tautog
Turbot
Vermillion Snapper
Walleye
White Crappie
White Mullet
White Perch
White Seabass
Yellow Perch

3 Average

Albacore Tuna
Atlantic Herring
Atlantic Mackerel
Atlantic Salmon
Blackfin Tuna
Blue Runner
Coho Salmon
Crevalle Jack
Jack Mackerel
Lake Sturgeon
Pacific Herring
Pink Salmon
Redeye Mullet
Shovelnose Sturgeon
Sierra
Surf Smelt

4 Moderately Dark

Atlantic Bonito
Atlantic Menhaden
Bluefish
Chinook Salmon
Little Tunny
Pacific Bonito
Skipjack Tuna
Sockeye Salmon
Yellowfin Tuna

5 Dark

Bluefin Tuna

FLAKINESS

1 Flaky

Albacore Tuna
Atlantic Bonito
Atlantic Cod
Atlantic Halibut
Atlantic Pollock
Atlantic Salmon
Bigmouth Buffalo
Black Drum
Black Grouper
Black Sea Bass
Blackfin Tuna
Bluefin Tuna
Carp
Cusk
Gag
Giant Sea Bass
Haddock
Jewfish
Little Tunny
Nassau Grouper
Ocean Whitefish
Pacific Bonito
Pacific Halibut
Red Snapper
Rockfish
Sablefish
Sauger
Scamp
Sheepshead
Skipjack Tuna
Smallmouth Buffalo
Snook
Sockeye Salmon
Spotted Cabrilla
Swordfish
Vermillion Snapper
Yellowfin Tuna
Yellowtail Snapper

2 Moderately Flaky

Alaska Pollock
American Plaice
Atlantic Croaker
Atlantic Mackerel
Atlantic Wolffish
Black Dogfish
Blue Catfish
Bluegill
Brook Trout
Brown Bullhead
Cabezon
Channel Catfish
Chinook Salmon
Chum Salmon
Lake Herring
Cobia
Coho Salmon
Common Dolphin
English Sole
Florida Pompano
Gray Triggerfish
King Mackerel
Lake Chub
Lake Sturgeon
Lake Sturgeon
Lake Trout
Lake Whitefish
Lingcod
Whiting
Ocean Perch (Atlantic)
Pacific Ocean Perch
Pink Salmon
Rainbow Trout
Redeye Mullet
Sand Shark
Scup
Sea Catfish
Shovelnose Sturgeon
Sierra
Southern Flounder
Striped Bass
Striped Mullet
Tautog
Turbot
Walleye
White Crappie
White Seabass
Winter Flounder
Witch Flounder

3 Average Flakiness

Arrowtooth Flounder
Blue Runner
Bluefish
Burbot
Butterfish
Dover Sole
Greenland Turbot
Jack Mackerel
Northern Pike
Ocean Pout
Pacific Hake
Pacific Herring
Pacific Pollock
Pacific Sanddab
Petrale Sole
Pigfish
Rainbow Smelt
Red Hake
Rex Sole
Silver Hake
Spot
Spotted Seatrout
Summer Flounder
White Perch
Yellow Perch
Yellowtail Flounder

4 Slightly Flaky

American Eel
Atlantic Herring
Crevalle Jack
Spanish Mackerel
Surf Smelt
White Hake
White Mullet
White Seatrout

5 Not Flaky

Altantic Menhaden
Monkfish
Spiny Dogfish

FIRMNESS

1 Firm

Alaska Pollock
Albacore Tuna
Atlantic Bonito
Atlantic Cod
Atlantic Halibut
Atlantic Pollock
Atlantic Salmon
Bigmouth Buffalo
Black Dogfish
Black Drum
Blackfin Tuna
Blue Catfish
Bluefin Tuna
Carp
Cusk
Gag
Haddock
Jewfish
Lake Sturgeon
Lingcod
Little Tunny
Nassau Grouper
Ocean Pout
Pacific Bonito
Pacific Halibut
Red Snapper
Sand Shark
Sauger
Sea Catfish
Shovelnose Sturgeon
Skipjack Tuna
Smallmouth Buffalo
Snook
Spotted Cabrilla
Swordfish
Vermillion Snapper
Yellowtail Snapper

2 Moderately Firm

American Eel
Atlantic Croaker
Atlantic Wolffish
Black Grouper
Black Sea Bass
Brook Trout
Brown Bullhead
Cabezon
Chinook Salmon
Chum Salmon
Common Dolphin
Florida Pompano
Giant Sea Bass
Gray Triggerfish
King Mackerel
Lake Trout
Monkfish
Whiting
Ocean Perch (Atlantic)
Ocean Whitefish
Pacific Ocean Perch
Petrale Sole
Pigfish
Rainbow Trout
Rex Sole
Rockfish
Scamp
Scup
Sheepshead
Sockeye Salmon
Spot
Striped Bass
Striped Mullet
Summer Flounder
White Perch
White Seabass
Yellow Perch
Yellowfin Tuna

3 Average Firmness

American Plaice
Arrowtooth Flounder
Atlantic Herring
Blue Runner
Bluefish
Bluegill
Burbot
Coho Salmon
Crevalle Jack
Dover Sole
English Sole
Greenland Turbot
Jack Mackerel
Lack Chub
Lake Whitefish
Northern Pike
Pacific Pollock
Pink Salmon
Rainbow Smelt
Redeye Mullet
Sablefish
Sierra
Silver Hake
Southern Flounder
Spanish Flounder
Spiny Dogfish
Spotted Seatrout
Surf Smelt
Tautog
Walleye
White Crappie
White Mullet
Winter Flounder
Witch Flounder
Yellowtail Flounder

4 Slightly Firm

Atlantic Mackerel
Butterfish
Lake Herring
Pacific Herring
Pacific Sanddab
Turbot
White Seatrout

5 Not Firm

Atlantic Menhaden
Pacific Hake
Red Hake
White Hake

COARSENESS

1 Smooth

American Eel
Atlantic Herring
Atlantic Menhaden
Bluegill
Butterfish
Lake Herring
Dover Sole
Florida Pompano
Lake Chub
Lake Trout
Lake Whitefish
Pacific Sanddab
Petrale Sole
Rainbow Smelt
Rainbow Trout
Red Hake
Rex Sole
Sauger
Southern Flounder
Spiny Dogfish
Spotted Seatrout
Striped Mullet
Summer Flounder
Tautog
Turbot
Walleye
White Seatrout
Winter Flounder
Witch Flounder
Yellowtail Flounder

2 Slightly Coarse

Alaska Pollock
Albacore Tuna
Ameican Plaice
Arrowtooth Flounder
Atlantic Cod
Atlantic Croaker
Atlantic Halibut
Atlantic Mackerel
Atlantic Pollock
Atlantic Salmon
Black Dogfish
Blackfin Tuna
Blue Catfish
Bluefish
Brook Trout
Burbot
Channel Catfish
Chinook Salmon
Coho Salmon
Common Dolphin
Crevalle Jack
Cusk
English Sole
Greenland Turbot
Haddock
King Mackerel
Lingcod
Ocean Pout
Ocean Whitefish
Pacific Hake
Pacific Halibut
Pacific Herring
Pacific Pollock
Pink Salmon
Red Snapper
Sablefish
Scup
Sierra
Silver Hake
Snook
Sockeye Salmon
Spanich Mackerel
Spot
Surf Smelt
Vermillion Snapper
White Crappie
Whitehake
White Mullet
White Perch
Yellow Perch
Yellowtail Snapper

3 Avg. Coarseness

Atlantic Wolffish
Bigmouth Buffalo
Black Grouper
Black Sea Bass
Blue Runner
Bluefin Tuna
Brown Bullhead
Carp
Chum Salmon
Cobia
Gag
Giant Sea Bass
Gray Triggerfish
Jack Mackerel
Little Tunny
Monkfish
Nassau Grouper
Whiting
Northern Pike
Ocean Perch (Atlantic)
Pacific Ocean Perch
Pigfish
Redeye Mullet
Rockfish
Sand Shark
Scamp
Sea Catfish
Sheepshead
Skipjack Tuna
Smallmouth Buffalo
Spotted Cabrilla
Striped Bass
Swordfish
White Seabass
Yellowfin Tuna

4 Moderately Coarse

Atlantic Bonito
Black Drum
Cabezon
Lake Sturgeon
Pacific Bonito
Shovelnose Sturgeon

5 Coarse

Jewfish

MOISTURE content
after cooking

1 Dry

---

2 Moderately Dry

Albacore Tuna
Atlantic Bonito
Blackfin Tuna
Bluefin Tuna
Cabezon
Little Tunny
Pacific Bonito
Skipjack Tuna
Swordfish
Yellowfin Tuna

3 Average

Atlantic Croaker
Atlantic Halibut
Atlantic Salmon
Black Dogfish
Burbot
Chum Salmon
Cobia
Common Dolphin
Florida Pompano
Lake Sturgeon
Northern Pike
Pacific Halibut
Pacific Ocean Perch
Pink Salmon
Rainbow Trout
Rockfish
Sand Shark
Sheepshead
Shovelnose Sturgeon
Sockeye Salmon
Spiny Dogfish
Spotted Cabrilla
Tautog
Walleye
White Perch
White Seabass
Yellow Perch

4 Moderately Wet

Alaska Pollock
American Eel
American Plaice
Arrowtooth Flounder
Atlantic Cod
Atlantic Herring
Atlantic Mackerel
Atlantic Pollock
Atlantic Wolffish
Black Drum
Black Grouper
Black Sea Bass
Blue Runner
Bluefish
Bluegill
Brook Trout
Butterfish
Carp
Channel Catfish
Chinook Salmon
Lake Herring
Coho Salmon
Crevalle Jack
Cusk
Dover Sole
English Sole
Gag
Giant Sea Bass
Gray Triggerfish
Greenland Halibut
Haddock
King Mackerel
Lake Chub
Lake Whitefish
Lingcod
Monkfish
Whiting
Ocean Perch (Atlantic)
Ocean Pout
Ocean Whitefish
Pacific Herring
Pacific Pollock
Pacific Sanddab
Petrale Sole
Pigfish
Rainbow Smelt
Red Hake
Red Snapper
Rex Sole
Sauger
Sierra
Silver Hake
Snook
Southern Flounder
Spot
Spotted Seatrout
Striped Bass
Striped Mullet
Summer Flounder
Surf Smelt
Turbot
Vermillion Snapper
White Crappie
White Hake
White Mullet
Winter Flounder
Witch Flounder
Yellowtail Flounder
Yellowtail Snapper

5 Wet

Atlantic Menhaden
Bigmouth Buffalo
Blue Catfish
Brown Bullhead
Jack Mackerel
Jewfish
Lake Trout
Nassau Grouper
Pacific Hake
Redeye Mullet
Sablefish
Scamp
Scup
Sea Catfish
Smallmouth Buffalo
Spanish Mackerel
White Seatrout

Index C

FINFISH LISTED ALPHABETICALLY BY COMMON NAME

COMMON NAME	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	SCIENTIFIC NAME
Striped BASS (Rockfish)	2	2	1	2	2	2	3	4	Morone saxatilis
BLUEFISH	5	4	4	4	3	3	2	4	Pomatomus saltatrix
BLUEGILL	1	1	2	2	2	3	1	4	Lepomis macrochirus
Atlantic BONITO (Common Bonito)	3	3	2	4	1	1	4	2	Sarda sarda
Pacific BONITO (California Bonito)	4	3	3	4	1	1	4	2	Sarda chiliensis
Bigmouth BUFFALO	2	3	1	2	1	1	3	5	Ictiobus cyprinellus
Smallmouth BUFFALO	2	3	1	2	1	1	3	5	Ictiobus bubalus
Brown BULLHEAD	2	2	2	1	2	2	3	5	Ictalurus nebulosus
BURBOT	3	2	1	2	3	3	2	3	Lota lota
BUTTERFISH	2	3	2	1	3	4	1	4	Poronotus triacanthus
CABEZON	3	2	2	2	2	2	4	2	Scorpaenichthys marmoratus
Spotted CABRILLA	1	2	1	1	1	1	3	3	Epinephelus analogus
CARP	3	3	2	2	1	1	3	4	Cyprinus carpio
Blue CATFISH	2	2	1	1	2	1	2	5	Ictalurus furcatus
Channel CATFISH	1	2	1	1	2	1	2	4	Ictalurus punctatus
Sea CATFISH	2	2	2	2	2	1	3	5	Galeichthys felis
Lake CHUB	3	4	2	2	2	3	1	4	Hybopsis plumbeua
COBIA (Crabeater)	3	2	2	1	2	1	3	3	Rachycentron canadum
Atlantic COD	1	2	1	1	1	1	2	4	Gadus morhua
White CRAPPIE	1	1	1	2	2	3	2	4	Pomoxis annularis
Atlantic CROAKER	2	3	3	2	2	2	2	3	Micropogon undulatus
CUSK	1	2	1	1	1	1	2	4	Brosme brosme

	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	
Black DOGFISH	2	2	3	2	2	1	2	3	Centroscyllium fabricii
Spiny DOGFISH	2	3	4	2	5	3	1	3	Squalus acanthias
Common DOLPHIN (Dorado)	3	2	2	1	2	2	2	3	Coryphaena hippurus
Black DRUM	3	3	2	2	1	1	4	4	Pogonias cromis
American EEL (Silver Eel)	3	4	2	2	4	2	1	2	Anguilla rostrata
Arrowtooth FLOUNDER	2	1	2	1	3	3	2	4	Atheresthes stomias
Southern FLOUNDER	1	2	1	1	2	3	1	4	Paralichthys lethostigma
Summer FLOUNDER (Fluke)	1	1	1	1	3	2	1	4	Paralichthys dentatus
Witch FLOUNDER	1	1	1	1	2	3	1	4	Glyptocephalus cynoglossus
Winter FLOUNDER (Blackback Flounder)	2	1	2	1	2	3	1	4	Pseudopleuronectes americanus
Yellowtail FLOUNDER	1	1	2	1	3	3	1	4	Limanda ferruginea
GAG	2	2	1	1	1	1	3	4	Mycteroperca microlepis
Black GROUPER	1	1	2	2	1	2	3	4	Mycteroperca bonaci
Nassau GROUPER	2	2	1	2	1	1	3	5	Epinephelus striatus
HADDOCK	1	2	1	1	1	1	2	4	Melanogrammus aeglefinus
Pacific HAKE	2	2	2	1	3	5	2	5	Merluccius productus
Red HAKE	2	2	1	1	3	5	1	4	Urophycis chuss
Silver HAKE	2	2	2	1	3	3	2	4	Merluccius bilinearis
White HAKE	1	3	2	1	4	5	2	4	Urophycis tenuis
Atlantic HALIBUT	2	2	1	2	1	1	2	3	Hippoglossus hippoglossus
Pacific HALIBUT	1	2	2	2	1	1	2	3	Hippoglossus stenolepis
Atlantic HERRING	3	5	3	3	4	3	1	4	Clupea harengus harengus
Lake HERRING (Cisco)	2	3	2	2	2	4	1	4	Coregonus artedii
Pacific HERRING	3	5	4	3	3	4	2	4	Clupea harengus pallasi

	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	
Crevalle JACK (Common Jack)	3	4	4	3	4	3	2	4	Caranx hippos
JEWFISH (Spotted Grouper)	2	2	1	2	1	1	5	5	Epinephelus itajara
LINGCOD	2	2	1	1	2	1	2	4	Ophidon elongatus
Atlantic MACKEREL	4	4	4	3	2	4	2	4	Scomber scombrus
Jack MACKEREL	4	4	2	3	3	3	3	5	Trachurus symmetricus
King MACKEREL (Kingfish)	4	3	4	2	2	2	2	4	Scomberomorus cavalla
Spanish MACKEREL (Spotted Mackerel)	4	4	4	2	4	3	2	5	Scomberomorus maculatus
Atlantic MENHADEN	5	5	5	4	5	5	1	5	Brevoortia tyrannus
MONKFISH	3	2	2	2	5	2	3	4	Lophius americanus
Redeye MULLET (Silver Mullet)	5	4	3	3	2	3	3	5	Mugil gaimardiana
Striped MULLET	2	4	1	2	2	2	1	4	Mugil cephalus
White MULLET	3	4	3	2	4	3	2	4	Mugil cerema
Atlantic Ocean PERCH (Rosefish) (Redfish)	3	2	2	2	2	2	3	4	Sebastes marinus
Pacific Ocean PERCH	1	2	1	2	2	2	3	3	Sebastodes alutus
White PERCH	2	1	1	2	3	2	2	3	Morone (Roccus) americana
Yellow PERCH	2	1	1	2	3	2	2	3	Perca flavascens
PIGFISH	1	3	1	2	3	2	3	4	Orthopristis chrysopters
Northern PIKE	3	2	3	2	3	3	3	3	Esox lucius
American PLAICE	2	2	2	1	2	3	2	4	Hippoglossoides platessoides
Alaska POLLOCK (Walleye Pollock)	1	2	1	2	2	1	2	4	Theragra chalcogramma
Pacific POLLOCK	2	2	2	2	3	3	2	4	Pollachius Virens
Florida POMPANO	2	3	2	2	2	2	1	3	Trachinotus carolinus
Ocean POUT	2	1	2	2	3	1	2	4	Macrozoarces americanus

	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	
ROCKFISH	3	2	2	2	1	2	3	3	Sebastodes species
Blue RUNNER	4	3	4	3	3	3	3	4	Caranx crysos
SABLEFISH	3	5	2	2	1	3	2	5	Anoplopoma fimbria
Atlantic SALMON	2	3	2	3	1	1	2	3	Salmo salar
Chinook SALMON	3	5	2	4	2	2	2	4	Oncorhynchus tshawytscha
Chum SALMON	2	3	2	2	2	2	3	3	Oncorhynchus keta
Coho SALMON	3	4	2	3	2	3	2	4	Oncorhynchus kisutch
Pink SALMON	2	3	4	3	2	3	2	3	Oncorhynchus gorbuscha
Sockeye SALMON	3	4	2	4	1	2	2	3	Oncorhynchus nerka
Pacific SANDDAL	1	2	2	1	3	4	1	4	Citharichthys sordious
SAUGER	2	2	1	1	1	1	1	4	Stizostedion canadense
SCAMP	1	2	1	1	1	2	3	5	Myceteroperca phenax
SCUP	3	3	1	2	2	2	2	5	Stenotomus chrysops
Black SEA BASS	2	2	2	2	1	2	3	4	Centropristas striatus
Giant SEA BASS	1	3	2	2	1	2	3	4	Stereolepis gigas
White SEABASS	1	1	2	2	2	2	3	3	Cynoscion nobilis
Spotted SEATROUT (Speckle Trout)	2	2	2	1	3	3	1	4	Cynoscion nebulosus
White SEATROUT (Sand Seatrout)	3	2	1	1	4	4	1	5	Cynoscion arenarius
Sand SHARK (Ground SHARK)	2	2	2	2	2	1	3	3	Odontaspis (Carcharias) taurus
SHEEPSHEAD	2	3	1	2	1	2	3	3	Archosargus probatocephalus
SIERRA	2	3	2	3	2	3	2	4	Scomberomorus sierra
Rainbow SMELT	1	2	1	2	3	3	1	4	Osmerus mordax
Surf SMELT	3	3	1	3	4	3	2	4	Hypomesus pretiosus
Red SNAPPER	2	2	1	1	1	1	2	4	Lutjanus campechanus (blackfordi)
Vermillion SNAPPER	2	1	1	2	1	1	2	4	Rhomboplites aurorubens
Yellowtail SNAPPER	1	1	1	1	1	1	2	4	Ocyurus chrysurus
SNOOK	2	1	1	1	1	1	2	4	Centropomus undecimalis

	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	
Dover SOLE	1	1	1	1	3	3	1	4	Microstomus pacificus
English SOLE	3	1	3	1	2	3	2	4	Parophrys vetulus
Petrale SOLE (Brill)	1	1	1	1	3	2	1	4	Eopsetta jordani
Rex SOLE	1	1	1	1	3	2	1	4	Glyptocephalus zachirus
SPOT	2	3	2	2	3	2	2	4	Leiostomus xanthurus
Lake STURGEON	3	3	4	3	2	1	4	3	Acipenser fulvescens
Shovelnose STURGEON	3	3	4	3	2	1	4	3	Scaphirhynchus platorynchus
SWORDFISH	3	3	2	2	1	1	3	2	Xiphias gladius
TAUTOG (Blackfish)	2	1	1	2	2	3	1	3	Tautoga onitis
Gray TRIGGERFISH	2	2	2	1	2	2	3	4	Balistes capriscus
Brook TROUT	1	3	1	2	2	2	2	4	Salvelinus fontinalis
Lake TROUT	2	4	1	2	2	2	1	5	Salvelinus namaycush
Rainbow TROUT	1	3	1	2	2	2	1	3	Salmo gairdneri
Albacore TUNA	2	4	1	3	1	1	2	2	Thunnus alalunga
Blackfin TUNA	2	2	2	3	1	1	2	2	Thunnus atlanticus
Bluefin TUNA (Horse Mackerel)	2	3	2	5	1	1	3	2	Thunnus thynnus
Skipjack TUNA (Oceanic Skipjack)	4	3	2	4	1	1	3	2	Euthynnus (Katsuwonus) pelamis
Yellowfin TUNA	2	2	1	4	1	2	3	2	Thunnus albacares
Little TUNNY (False Albacore)	3	2	1	4	1	1	3	2	Ethynnus alletteratus
TURBOT	2	2	1	2	2	4	1	4	Psetta (Scophthalmus) maxima
Greenland TURBOT	2	3	2	2	3	3	2	4	Reinhardtius hippoglossus
WALLEYE	1	2	1	2	2	3	1	3	Stizostedion vitreum vitreum
Lake WHITEFISH (Common Whitefish)	1	3	1	1	2	3	1	4	Coregonus clupeaformis
Ocean WHITEFISH	1	2	1	1	1	2	2	4	Caulolatilus princeps
WHITING (Northern Kingfish)	2	3	2	2	2	2	3	4	Menticirrhus saxatilis
Atlantic WOLFFISH	2	2	2	1	2	2	3	4	Anarhichas lupus

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FINFISH LISTED BY ZOOLOGICAL CATEGORY AND SCIENTIFIC NAME

SCIENTIFIC NAME	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	COMMON NAME
CARTILAGINOUS FISHES									
Odontaspis (carcharias) taurus	2	2	2	2	2	1	3	3	Sand Tiger (Sand Shark)
Order: SQUALIFORMES Family: SQUALIDAE									
Centroscyllium fabricii	2	2	3	2	2	1	2	3	Black Dogfish
Squalus acanthias	2	3	4	2	5	3	1	3	Spiny Dogfish
BONY FISHES									
Order: ACIPENSORIFORMES Family: ACIPENSERIDAE									
Acipenser fulvescens	3	3	4	3	2	1	4	3	Lake Sturgeon
Scaphirhynchus platorynchus	3	3	4	3	2	1	4	3	Shovelnose Sturgeon
Order: ANGUILLIFORMES Family: ANGUILLIDAE									
Anguilla rostrata	3	4	2	2	4	2	1	4	American Eel (Silver Eel)
Order: CLUPEIFORMES Family: CLUPEIDAE									
Brevoortia tyrannus	5	5	5	4	5	5	1	5	Atlantic Menhaden
Clupea harengus harengus	3	5	3	3	4	3	1	4	Atlantic Herring
Clupea harengus pallasi	3	5	4	3	3	4	2	4	Pacific Herring
Order: CYPRINIFORMES Family: CATOSTOMIDAE									
Ictiobus bubalus	2	3	1	2	1	1	3	5	Smallmouth Buffalo
Ictiobus cyprinellus	2	3	1	2	1	1	3	5	Bigmouth Buffalo
Family: CYPRINIDAE									
Cyprinus carpio	3	3	2	2	1	1	3	4	Carp
Hybopsis plumbeua	3	4	2	2	2	3	1	4	Lake Chub

	FLAVOR FAT ODOR COLOR	FLAKINESS FIRMNESS COARSENESS MOISTNESS	
Order: GADIFORMES Family: GADIDAE			
Brosme brosme	1 2 1 1	1 1 2 4	Cusk
Gadus morhua	1 2 1 1	1 1 2 4	Atlantic Cod
Lota lota	3 2 1 2	3 3 2 3	Burbot (Ling)
Melanogrammus aeglefinus	1 2 1 1	1 1 2 4	Haddock
Merluccius bilinearis	2 2 2 1	3 3 2 4	Silver Hake
Merluccius productus	2 2 2 1	3 5 2 5	Pacific Hake
Pollachius pollachius	3 2 2 2	1 1 2 4	Atlantic Pollock
Pollachius virens	2 2 2 2	3 3 2 4	Pacific Pollock
Theragra chalcogramma	1 2 1 2	2 1 2 4	Walleye Pollock (Alaska Pollock)
Urophycis tennuis	1 3 2 1	4 5 2 4	White Hake
Urophycis chuss	2 2 1 1	3 5 1 4	Red Hake
Family: ZOARCIDAE			
Macrozoarces americanus	2 1 2 2	3 1 2 4	Ocean Pout
Order: LOPHIFORMES Family: LOPHIIDAE			
Lophius americanus	3 2 2 2	5 2 3 4	Monkfish
Order: PERCIFORMES Family: ANARHICHADIDAE			
Anarhichas lupus	2 2 2 1	2 2 3 4	Atlantic Wolffish
Family: ANOPLOPOMATIDAE			
Anoplopoma fimbria	3 5 2 2	1 3 2 5	Sablefish
Family: BRANCHIOSTEGIDAE			
Caulolatilus princeps	1 2 1 1	1 2 2 4	Ocean Whitefish
Family: CARANGIDAE			
Caranx crysos	4 3 4 3	3 3 3 4	Blue Runner
Caranx hippos	3 4 4 3	4 3 2 4	Crevalle Jack (Common Jack)

	FLAVOR FAT ODOR COLOR	FLAKINESS FIRMNESS COARSENESS MOISTNESS	
Family: CARANGIDAE (Cont.)			
Trachinotus carolinas	2 3 2 2	2 2 1 3	Florida Pompano
Trachurus symmetricus	4 4 2 3	3 3 3 5	Jack Mackerel
Family: CENTRARCHIDAE			
Lepomis macrochirus	1 1 2 2	2 3 1 4	Bluegill
Pomoxis annularis	1 1 1 2	2 3 2 4	White Crappie
Family: CENTROPOMIDAE			
Centropomus undecimalis	2 1 1 1	1 1 2 4	Snook
Family: CORYPHAENIDAE			
Coryphaena hippurus	3 2 2 1	2 2 2 3	Common Dolphin (Dorado)
Family: COTTIDAE			
Scorpaenichthys marmoratus	3 2 2 2	2 2 4 2	Cabezon
Family: HEXAGRAMMIDAE			
Ophidon elongatus	2 2 1 1	2 1 2 4	Lingcod
Family: LABRIDAE			
Tautoga onitis	2 1 1 2	2 3 1 3	Tautog (Blackfish)
Family: LUTJANIDAE			
Lutjanus campechanus	2 2 1 1	1 1 2 4	Red Snapper
Ocyurus chrysurus	1 1 1 1	1 1 2 4	Yellowtail Snapper
Rhomboplites aurorubens	2 1 1 2	1 1 2 4	Vermillion Snapper
Family: MAGILIDAE			
Mugil cephalus	2 4 1 2	2 2 1 4	Striped Mullet (Black Mullet)
Mugil cerema	3 4 3 2	4 3 2 4	White Mullet
Mugil gaimardiana	5 4 3 3	2 3 3 5	Redeye Mullet (Silver Mullet)

	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	
Family: PERCICHTHYIDAE									
Morone (roccus) americana	2	1	1	2	3	2	2	3	White Perch
Morone saxatilis	2	2	1	2	2	2	3	4	Striped Bass (Rockfish)
Stereolepis gigas	1	3	2	2	1	2	3	4	Giant Sea Bass
Family: PERCIDAE									
Perca flavascens	2	1	1	2	3	2	2	3	Yellow Perch
Stizostedion canadense	2	2	1	1	1	1	1	4	Sauger
Stizostedion vitreum vitreum	1	2	1	2	2	3	1	3	Walleye
Family: POMADASYIDAE									
Orthopristis chrysopters	1	3	1	2	3	2	3	4	Pigfish
Family: POMATOMIDAE									
Pomatomus saltatrix	5	4	4	4	3	3	2	4	Bluefish
Family: RACHYCENTRIDAE									
Rachycentron canadum	3	2	2	1	2	1	3	3	Cobia (Crabeater)
Family: SCIAENIDAE									
Cynoscion arenarius	3	2	1	1	4	4	1	5	White Seatrout (Sand Seatrout)
Cynoscion nebulosus	2	2	2	1	3	3	1	4	Spotted Seatrout (Speckled Trout)
Cynoscion nobilis	1	1	2	2	2	2	3	3	White Seabass
Leiostomus xanthurus	2	3	2	2	3	2	2	4	Spot
Menticirrhus saxatilis	2	3	2	2	2	2	3	4	Northern Kingfish (Whiting)
Micropogon undulatus	2	3	3	2	2	2	2	3	Atlantic Croaker
Pogonias cromis	3	3	2	2	1	1	4	4	Black Drum
Family: SCOMBRIDAE									
Euthynnus alletteratus	3	2	1	4	1	1	3	2	Little Tunny (False Albacore)
Euthynnus (katsuwonus) pelamis	4	3	2	4	1	1	3	2	Skipjack Tuna (Oceanic Skipjack)

	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	
Family: SCOMBRIDAE (Cont.)									
Sarda sarda	3	3	2	4	1	1	4	2	Atlantic Bonito (Common Bonito)
Sarda chiliensis	4	3	3	4	1	1	4	2	Pacific Bonito (California Bonito)
Scomber scombrus	4	4	4	3	2	4	2	4	Atlantic Mackerel
Scomberomorus cavalla	4	3	4	2	2	2	2	4	King Mackerel (Kingfish)
Scomberomorous maculatus	4	4	4	2	4	3	2	5	Spanish Mackerel (Spotted Mackerel)
Scomberomorous sierra	2	3	2	3	2	3	2	4	Sierra
Thunnus alalunga	2	4	1	3	1	1	2	2	Albacore Tuna (Longfin Tuna)
Thunnus albacares	2	2	1	4	1	2	3	2	Yellowfin Tuna
Thunnus atlanticus	2	2	2	3	1	1	2	2	Blackfin Tuna
Thunnus thynnus	2	3	2	5	1	1	3	2	Bluefin Tuna (Horse Mackerel)
Family: SCORPAENIDAE									
Sebastes marinus	3	2	2	2	2	2	3	4	Ocean Perch (Rosefish Redfish)
Sebastodes alutus	1	2	1	2	2	2	3	3	Pacific Ocean Perch
Sebastodes species	3	2	2	2	1	2	3	3	Rockfishes
Family: SERRANIDAE									
Centropristas striatus	2	2	2	2	1	2	3	4	Black Sea Bass
Epinephelus analogus	1	2	1	1	1	1	3	3	Spotted Cabrilla
Epinephelus itajara	2	2	1	2	1	1	5	5	Jewfish (Spotted Grouper)
Epinephelus striatus	2	2	1	2	1	1	3	5	Nassau Grouper
Mycteroperca bonaci	1	1	2	2	1	2	3	4	Black Grouper
Mycteroperce microlepis	2	2	1	1	1	1	3	4	Gag
Mycteroperca phenax	1	2	1	1	1	2	3	5	Scamp

	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	
Family: SPARIDAE									
Archosargus probatocephalus	2	3	1	2	1	2	3	3	Sheepshead
Stenotomus chrysops	3	3	1	2	2	2	2	5	Scup (Porgy)
Family: STROMATEIDAE									
Poronotus triacanthus	2	3	2	1	3	4	1	4	Butterfish
Family: XIPHIIDAE									
Xiphias gladius	3	3	2	2	1	1	3	2	Swordfish
Order: PLEURONECTIFORMES Family: BOTHIDAE									
Citharichthys sordious	1	2	2	1	3	4	1	4	Pacific Sanddab
Paralichthys dentatus	1	1	1	1	3	2	1	4	Summer Flounder (Fluke)
Paralichthys lethostigma	1	2	1	1	2	3	1	4	Southern Flounder
Family: Pleuronectidae									
Atheresthes stomias	2	1	2	1	3	3	2	4	Arrowtooth Flounder
Eopsetta jordani	1	1	1	1	3	2	1	4	Petrale Sole (Brill)
Glyptocephalus cynoglossus	1	1	1	1	2	3	1	4	Witch Flounder
Glyptocephalus zachirus	1	1	1	1	3	2	1	4	Rex Sole
Hippoglossus stenolepis	1	2	2	2	1	1	2	3	Pacific Halibut
Hippoglassoides platessoides	2	2	2	1	2	3	2	4	American Plaice
Hippoglossus hippoglossus	2	2	1	2	1	1	2	3	Atlantic Halibut
Limanda ferruginea	1	1	2	1	3	3	1	4	Yellowtail Flounder
Microstomus pacificus	1	1	1	1	3	3	1	4	Dover Sole
Parophrys vetulus	3	1	3	1	2	3	2	4	English Sole
Psetta (scophthalmus) maxima	2	2	1	2	2	4	1	4	Turbot
Pseudopleuronectes americanus	2	1	2	1	2	3	1	4	Winter Flounder (Blackback Flounder)
Reinhardtius hippoglossoides	2	3	2	2	3	3	2	4	Greenland Turbot (Greenland Halibut)

	FLAVOR	FAT	ODOR	COLOR	FLAKINESS	FIRMNESS	COARSENESS	MOISTNESS	
Order: SALMONIFORMES									
Family: ESOCIDAE									
Esox lucius	3	2	3	2	3	3	3	3	Northern Pike
Family: OSMERIDAE									
Hypomesus pretiosus	3	3	1	3	4	3	2	4	Surf Smelt
Osmerus mordax	1	2	1	2	3	3	1	4	Rainbow Smelt
Family: SALMONIDAE									
Coregonus artedii	2	3	2	2	2	4	1	4	Cisco (Lake Herring)
Coregonus clupeaformis	1	3	1	1	2	3	1	4	Lake Whitefish (Common Whitefish)
Oncorhynchus gorbuscha	2	3	4	3	2	3	2	3	Pink Salmon
Oncorhynchus keta	2	3	2	2	2	2	3	3	Chum Salmon
Oncorhynchus kisutch	3	4	2	3	2	3	2	4	Coho Salmon
Oncorhynchus nerka	3	4	2	4	1	2	2	3	Sockeye Salmon
Oncorhynchus tshawytscha	3	5	2	4	2	2	2	4	Chinook Salmon
Salmo gairdneri	1	3	1	2	2	2	1	3	Rainbow Trout
Salmo salar	2	3	2	3	1	1	2	3	Atlantic Salmon
Salvelinus fontinalis	1	3	1	2	2	2	2	4	Brook Trout
Salvelinus namaycush	2	4	1	2	2	2	1	5	Lake Trout
Order: SILURIFORMES									
Family: ARIIDAE									
Galeichthys felis Arius felis	2	2	2	2	2	1	3	5	Sea Catfish
Family: ICTALURIDAE									
Ictalurus furcatus	2	2	1	1	2	1	2	5	Blue Catfish
Ictalurus nebulosus	2	2	2	1	2	2	3	5	Brown Bullhead
Ictalurus punctatus	1	2	1	1	2	1	2	4	Channel Catfish
Order: TETRACDONTIFORMES									
Family: BALISTIDAE									
Balistes capriscus	2	2	2	1	2	2	3	4	Gray Triggerfish

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SHELLFISH LISTED BY ZOOLOGICAL CATEGORY AND COMMON NAME

COMMON NAME	SCIENTIFIC NAME
CRUSTACEANS (Class: CRUSTACEA)	
Blue CRAB	Callinectes sapidus
Dugeness CRAB (Edible Crab)	Cancer magister
Jonah CRAB	Cancer borealis
King CRAB	Paralithodes camtschatica
Rock CRAB	Cancer irroratus
Snow CRAB (Tanner Crab)	Chionoectes species
Stone CRAB	Menippe mercenaria
Red Swamp CRAYFISH (Louisiana Crayfish)	Procambarus (Cambarus) clarki
California Spiny LOBSTER (Northern Lobster)	Panulirus interruptus
Florida Spiny LOBSTER (Northern Lobster)	Panulirus argos
Maine LOBSTER (American Lobster)	Homarus americanus
Common SHRIMP	Leaner serratus
Freshwater SHRIMP	Macrobrachium rosenbergii
Northern SHRIMP	Pandalus borealis
Pacific SHRIMP	Pandalus jordani
Waite, SHRIMP (White Shrimp)	Panaeus setiferus

BIVALVES (Class: PELECYPODA)

Alaskan Gaper CLAM (Horse Clam)	Tresus capax
Atlantic Jacknife CLAM (Eastern Razor Clam)	Ensis directus
Atlantic Surf CLAM	Spisula solidissima
Butter CLAM (Smooth Washington Clam)	Saxidomus giganteus
Calico CLAM	Macrocallista maculata
Hardshell CLAM (Cherrystone Clam) (Littleneck Clam) (Northern Quahog)	Mercenaria mercenaria
Japanese Littleneck CLAM (Manila Littleneck Clam)	Tapes phillippinarum
Pacific Geoduck CLAM	Panopea generosa
Pacific Littleneck CLAM	Protothaca staminea
Pacific Razor CLAM	Siliqua patula
Pismo CLAM	Tivela stultorum
Softshell CLAM (Steamer Clam)	Mya arenaria
Nuttal's COCKLE (Basket Cockle)	Cardium corbis
Ocean QUAHOG	Arctica islandica
Common RANGIA	Rangia Cuneata
Common California VENUS	Chione californiensis
Smooth Pacific VENUS	Chione fluctifraga
California MUSSEL (Sea Mussel)	Mytilus californianus
Common Blue MUSSEL	Mytilus edulis

Eastern OYSTER	Crassostrea virginica
Giant Pacific OYSTER (Japanese Oyster)	Crassostrea gigas
Olympia OYSTER (Native Pacific Oyster)	Ostrea lurida

Atlantic Bay SCALLOP	Aequipecten irradians
Giant Pacific SCALLOP	Pecten caurinus
Atlantic Deep Sea SCALLOP	Placopecten magellanicus
Hinds SCALLOP (Northern Scallop)	Chlamys rubida

UNIVALVES (Class: GASTROPODA)

Pink ABALONE (Green Abalone)	Haliotis fulgens
Red ABALONE	Haliotis rufescens
Atlantic CONCH	Busycon carica eliceans
Pink CONCH	Strombus gigas
Saw Toothed PENSHELL	Atrina serrata
Stiff PENSHELL (Prickly Penshell)	Atrina rigida
Common European PERIWINKLE (Snail)	Littorina littorea
Channelled WHELK	Busycon canaliculatum
Knobbed WHELK	Busycon carica
Waved WHELK (Common Northern Buccinum)	Buccinum undatum

CEPHALOPODS (Class: CEPHALOPODA)

Common Atlantic OCTOPUS	Octopus vulgaris
Two Spotted OCTOPUS	Octopus bimaculatus
Atlantic Long Finned SQUID	Loligo pealei
Atlantic Oval SQUID	Sepioteuthis sepioidea
Brief Thumstall SQUID	Liliguncula brevis
Common Pacific SQUID	Loligo opalescens
Common Short-Finned SQUID	Illex illecebrossus